



UC4+TM
ROLL CONTROL
Patented

Spray Height Controller



UC4+ SERVICE MANUAL 2012

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1 Getting Started

1.1 Safety Precautions

The UC4+™ Spray Height Control system will greatly improve your spraying height accuracy and protect the boom against damage in a wide variety of field conditions. However, under some circumstances performance may be limited. The operator of the sprayer must remain alert at all times and override the automatic control when necessary.

Important

Under no circumstances should any service work be performed on the machinery while the UC4+™ Spray Height Control system is in Automatic Mode.

Always ensure that the UC4+™ Spray Height Control system is powered down or in Manual Mode:

- Before leaving the operator's seat.
- When transporting the machine.

Before working on any part of the booms:

- Set the UC4+™ system to Manual Mode.
- Turn the sprayer engine off.

Do not operate this system before:

- Reading and understanding the operator's manual.
- Thoroughly understanding the machine operation.

1.2 Related Documents

The following documents should be used for reference in addition to this service manual.

- UC4+™ Operator Manual
- UC4+™ Cable Guide
- UC4+™ Installation Manual (for your sprayer type)
- UC4+™ End User Installation Manual (for your sprayer type, if applicable)

1.3 How to Use This Manual

This manual is designed to assist technicians with troubleshooting the UC4+™ Height Control System. To use this guide follow these steps:

1. Gather some initial information (**Section 1.4**).
2. Identify the symptom (**Section 2**).
3. Follow the list of actions under the symptom until you have found and solved the problem.

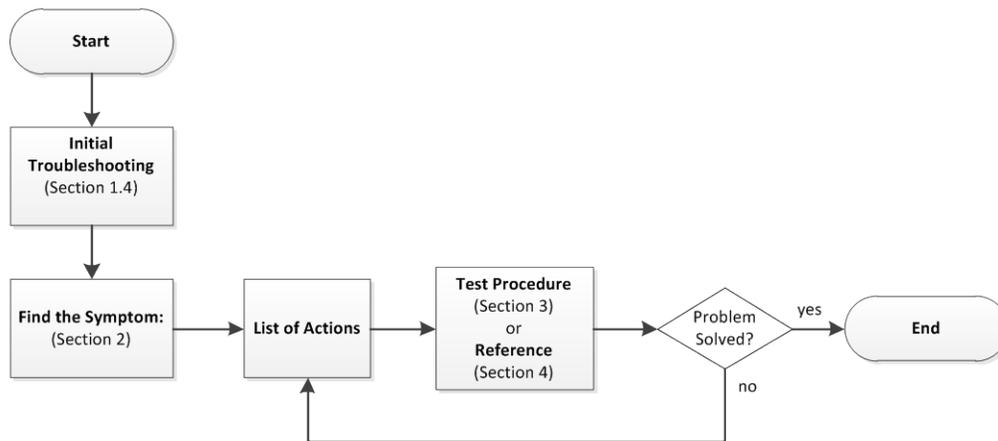


Figure 1: Troubleshooting Flowchart

1.4 Initial Troubleshooting

Before troubleshooting the problem, gather some basic information about the problem and the sprayer.

- What is the sprayer make and model?
- Are there additional options: Active Roll™, Severe Terrain, Enhanced Stability or Proportional Main Lift?
- Customer information: name and location.
- What is the firmware version and serial number of the UC4+ Control Panel?
- Is this a new installation?
- Are there any error messages?
- What is the perceived problem? Can you recreate the problem? Is it intermittent?
- Has anything changed since the system was working? Have any settings changed or has an Automatic Setup or Retune been attempted?

2 Symptoms

2.1 General Operation

The system will not go into automatic mode.

Possible Cause	Action	Section
The Automatic System Setup has not been completed.	If you have not completed an Automatic Setup then complete it now.	4.2
The Height Sensors are out of range.	Lower the booms to normal working height.	N/A
Poor Height Sensor readings.	Test the Height Sensors.	3.1

The system will not go into manual when the sprayer switches are pressed.

Possible Cause	Action	Section
Input wires may be damaged or not installed correctly.	Test the switch inputs.	3.9

The system resets when a valve is turned on.

Possible Cause	Action	Section
Poor power or ground connection.	Check the power supply.	3.4

The system will not power up.

Possible Cause	Action	Section
Poor power or ground connection.	Check the power supply.	3.4

The system intermittently goes into manual mode.

Possible Cause	Action	Section
The Height Sensors are reading “NR”.	Test the Height Sensors.	3.1
The interface cable may be damaged or not installed correctly.	Ensure the interface cable is installed correctly and not damaged. Refer to your installation manual.	N/A
There may be noise on the sprayer’s electrical system.	Ensure the interface cable is not routed near the sprayer’s valve coils.	N/A
	Add a power line filter or freewheeling diodes on one or more of the sprayer’s solenoid valves.	N/A

2.2 Operational Messages

“NC” (No Communication)

Possible Cause	Action	Section
Failed sensor or CANbus.	Test the communication.	3.5

“NR” or “NoRdg” (No Reading)

Possible Cause	Action	Section
Height Sensor is reporting “NR”.	It is normal to see this message occasionally for Height Sensors. If you are seeing this message all the time the Height Sensor may be having difficulty obtaining a proper reading. Test the Height Sensors.	3.1

“Minimum Override”

Possible Cause	Action	Section
This message is displayed when the target height is lower than the Minimum Height Mode allows.	Raise the target height.	N/A

“Disabled”

Possible Cause	Action	Section
Access to the system setup features (Automatic Install, ReTune) has been disabled by the installer to avoid unintentional system changes.	If you need to access the setup features that have been disabled, contact your NORAC dealer.	N/A

“>>>>>>>>>>”

Possible Cause	Action	Section
The control panel is busy with a task that may take a few seconds.	Wait for the arrows to disappear before activating any control panel switches.	N/A

“Absent”

Possible Cause	Action	Section
This message is typically shown on startup if one or more of the sensors are not communicating on the CANbus.	Test the communication.	3.5

2.3 Hydraulics

The boom will not raise or lower.

Possible Cause	Action	Section
The hydraulics or electrical outputs are not functioning or are not installed correctly.	Perform the Boom Function Test.	3.6

The boom will raise when it should lower, or vice versa.

Possible Cause	Action	Section
The raise and lower lines to the tilt cylinders may be reversed.	Ensure the raise lines are connected to the “B” ports and the lower lines are connected to the “A” ports.	N/A
	Perform the Boom Function Test.	3.6

The hydraulic oil is overheating.

Possible Cause	Action	Section
Using the UC4+™ system at higher sensitivities may create a greater demand on the sprayer’s hydraulics.	Try lowering the sensitivity.	N/A
The hydraulic system may require an open center valve block.	An open center valve block option is available from Norac which may reduce heating on certain hydraulic systems. Contact your NORAC dealer for more details.	N/A

The boom will creep up or down in Manual Mode.

Possible Cause	Action	Section
The raise and lower lines to the tilt cylinders may be reversed.	Ensure the raise lines are connected to the “B” ports and the lower lines are connected to the “A” ports.	N/A
There may be an internal problem with the NORAC valve block. Some possible causes are; a sticky valve, worn valve, faulty check valves or a foreign object stuck in the valve block.	If possible try removing any foreign objects in the valve. The valve block may also need to be repaired or replaced.	N/A
This may be caused by a problem with the sprayer’s hydraulic system.	Check the sprayer hydraulics. Check if the tilt cylinders are leaking and replace the seals if needed.	N/A

2.4 Performance

The boom is unstable, erratic or sluggish in Automatic Mode.

Possible Cause	Action	Section
Automatic System Setup has not been completed.	If you have not completed an Automatic Setup then complete it now.	4.2
Incorrect settings.	Check the settings.	3.12
Poor Height Sensor readings.	Test the Height Sensors.	3.1
Poor Roll Sensor readings.	Test the Roll Sensors.	3.2
Failed Temperature Sensor.	Test the Temperature Sensor.	3.3
There may be a problem with the mechanics of the sprayer.	Check the sprayer mechanical components.	3.11
Failed sensor or CANbus.	Test the communication.	3.5
Incorrect Roll Sensor mounting.	Check the Roll Sensor mounting as shown in the installation manual for your kit.	4.5
Incorrect Height Sensor mounting.	Check the Height Sensor mounting as shown in the installation manual for your kit.	4.4
The system may not be driving a boom function, or driving the wrong boom function.	Perform the Boom Function Test.	3.6
Low or inconsistent boom speeds.	Test the boom speeds.	3.10

The boom does not appear to be level in Automatic Mode.

Possible Cause	Action	Section
The sensitivity setting may be too low.	Check the sensor height readings from the run screen, if it differs from the target height then try turning up the sensitivity. The default tolerance for a sensitivity setting of 5 is ± 6 cm (2.5 inches).	N/A
The Deadzone setting may be calibrated incorrectly.	Check the Deadzone settings.	3.12.1
The sensor offset heights may be incorrect.	Test the Height Sensors.	3.1

The boom moves all the way to the top in Crop Mode.

Possible Cause	Action	Section
The sensors may be reading off of the boom in Crop Mode.	Ensure the sensors are aligned and mounted correctly.	4.4
Poor Height Sensor readings.	Test the Height Sensors.	3.1

2.5 Automatic Setup or Retune Problems

When performing an Automatic Setup or Retune:

- The sprayer must be over level bare dirt or gravel. Do not perform the auto setup over vegetation, concrete, water or snow.
- The hydraulic system should be under a normal load and at a normal working temperature. The oil should be warm and the sprayer's engine should be normal working RPM. Start the solution pump if possible.

For Retune problems only, follow **Section 2.5.5** below.

2.5.1 Starting the Automatic Setup

Ensure you have selected the correct sprayer type. Refer to **Section 4.16** for a list of sprayer types.

A list of connected sensors will be displayed. Ensure the list matches the sensors included in your system.

Automatic Setup does not show all the correct sensors are connected.

Possible Cause	Action	Section
Failed sensor or CANbus.	Test the communication.	3.5

2.5.2 Switch Test

When you press the sprayer's switches during the switch test, the system will check for voltage on the corresponding input line. It will show "OK" for each correct switch press. If it sees a voltage on another input line it will let you know there is an error.

The system does not detect a switch press or indicates there is an error.

Possible Cause	Action	Section
The interface cable may not be correctly installed.	Check the inputs.	3.9

Note: Not all sprayer types will perform the Switch Test.

2.5.3 Sensor Detect

During this test the system will set the sensors height at 35 inches (90 cm) and then move the booms to determine which sensors are located where on the sprayer.

The left or right wing does not move during the sensor detect test.

Possible Cause	Action	Section
The hydraulics are not functioning or not installed correctly.	Perform a boom function test.	3.6
The electrical outputs to the valves are not functioning or are installed incorrectly.		

The left and right wings move up but the sensor detect test does not finish or gives an error.

Possible Cause	Action	Section
Poor Height Sensor readings.	Test the Height Sensors.	3.1
The left and right wings will move down after the sensor detect test. If the test times out or stalls after the right wing moves up, then the down functions may not be functioning correctly.	Perform a boom function test.	3.6

2.5.4 Boom Geometry Calibration

When calibrating the boom geometry, push the boom down approximately 2 – 3 feet (50 – 100 cm) and then let go of the boom. Do not push the boom tip into the ground when performing this test.

Note: Not all sprayer types will perform the Boom Geometry Calibration.

The boom geometry calibration fails, does not finish or finishes before the boom is pushed.

Possible Cause	Action	Section
Incorrect Roll Sensor mounting.	Check the Roll Sensor mounting as shown in the installation manual for your kit.	4.5
Poor Height Sensor readings.	Test the Height Sensors.	3.1
Poor Roll Sensor readings.	Test the Roll Sensors.	3.2
The boom may not be pivoting freely.	Check the sprayer mechanical components.	3.11

2.5.5 Hydraulic Calibration

The hydraulic calibration “times out” or gives an error.

Possible Cause	Action	Section
Poor calibration target.	Ensure you are performing the calibration over bare level gravel or soil.	N/A
	If the system “hangs up” during the Automatic Setup, release the “Auto” switch and move the booms to normal working height and/or move the sprayer forward or backward a little. Press and hold the “Auto” switch to resume.	N/A
Poor Height Sensor readings.	Test the Height Sensors.	3.1
Poor Height Sensor mounting.	Check the Height Sensor mounting.	4.4
Poor Roll Sensor readings.	Test the Roll Sensors.	3.2
Poor Roll Sensor mounting.	Check the Roll Sensor mounting.	4.5
Excessively windy conditions.	If you are trying to calibrate in excessively windy conditions, the boom may always be moving due to the wind and the system will not be able to calibrate correctly. Calibrate the system in less windy conditions.	N/A
Problem with the sprayer mechanics.	Check the sprayer mechanics.	3.11
The sensors went out of range during the calibration.	If the system “hangs up” during the Automatic Setup, release the “Auto” switch and move the booms to normal working height. Press and hold the “Auto” switch to resume.	N/A
The boom was not set close to 35” (90 cm) during the Sensor Detect.	Restart the Automatic Setup and ensure the boom is at 35” (90 cm) for the Sensor Detect.	N/A

3 Test Procedures

3.1 Height Sensor Test

Before testing the Height Sensors, perform a visual check of the sensors to look for any physical damage or improper mounting. Refer to **Section 4.4** for proper Height Sensor mounting.

1. Ensure the system has previously completed an Automatic Setup. If the system has not passed the Sensor Detect portion of the Automatic Setup then the sensors may not be configured to the correct locations.
2. Perform this test over level bare soil or gravel. The system must be in Manual and Soil mode.
3. Level the booms and adjust the main lift to 10 inches (25 cm) above the ground or to the bottom of the stroke.
4. Press “Sensor Display” to navigate to the “Left Outer” height reading screen.
5. Check the height reading of the “Left Outer” Height Sensor while raising the left boom manually up to 80 inches (200 cm).
6. You should see a continuous and accurate height reading from 10 inches (25 cm) to 80 inches (200 cm).
7. Repeat steps 2 to 6 for each of the Height Sensors.
8. Repeat steps 2 to 7 in Crop Mode.

Refer to the following sections for troubleshooting if you experience any of the following errors:

Error message: “NR”	Page 17
Error message: “NC”	Page 18
Inaccurate or erratic height reading	Page 18

Error message: “NR”.

Possible Cause	Action	Section
The sensor may be saturated with water.	If the sensors get saturated with rain water, unfold the booms so the sensors point towards the ground and allow the sensors to dry out. You can also remove the sensor foams, squeeze the water out of them and reinstall them into the sensors. The system can be left running while the sensors dry out.	N/A
The sensor may be covered in mud or debris.	The sensor foams are designed to keep mud and debris off of the sensor transducer. If the sensor foams become dirty you can replace them or remove them from the sensor, clean them and reinstall them into the sensors. If the transducer becomes dirty you can gently wash it out with clean water. Do not use any high pressure water or chemicals on the transducer.	N/A
The sensor may be reading off a poor target such as snow, water, ice or concrete.	When testing the sensors always test over level bare soil or gravel.	N/A
The sensor may be reading off the boom.	Try moving the sensor to a different location and repeat the sensor test. Check the Height Sensor mounting.	4.4
If the sensor is still reporting “NR” errors then it may be a faulty transducer or sensor.	Replace the sensor or send it to your local Norac service center for repair.	4.8.1

Error message: “NC”.

Possible Cause	Action	Section
Failed sensor or CANbus.	Test the communication.	3.5

Inaccurate or erratic height reading.

Possible Cause	Action	Section
The sensor may be reading off the boom.	Check the sensor mounting. Try moving the sensor to a different location and repeat the sensor test. Reading off the boom may be more apparent when the system is in crop mode.	4.4
The sensor offset height has not been set correctly.	Set the sensor heights.	7
The Height Sensor serial numbers are not mapped to the correct locations.	Ensure the Height Sensors are properly configured.	4.9.1
If the sensor is still reporting an inaccurate or erratic reading then it may be a faulty transducer or sensor.	Replace the sensor or send it to your local Norac service center for repair.	4.8.1

3.2 Roll Sensor Test

Perform the applicable Roll Sensor Test for your system:

- Passive Roll (**Section 3.2.1**)
- Enhanced Stability (**Section 3.2.2**)
- Active Roll™ (**Section 3.2.3**)

3.2.1 Passive Roll

1. Perform a visual check of the sensors to look for any physical damage or improper mounting. Refer to **Section 4.5** for proper Roll Sensor mounting techniques.
2. Navigate to the Roll Sensor reading of the BF and IF roll sensors (from the run screen press “Sensor Display” until “More?”->press “Yes”->press “Sensor Display” until “Roll”->press “Yes”->press “Sensor Display” until “BFh” or “IFh”).
3. When the boom is stable, the BFh and IFh readings should be stable within a maximum of 10 points.
4. While viewing the BFh reading, with an assistant, push down on either boom tip, hold for a second and let go. You should see a continuous change in the BFh reading.

Note: If you do not have someone else to help you push the boom down you can try manually lifting one boom to force the center section to roll slightly.

Refer to the following sections for troubleshooting if you experience any of the following errors:

Error message: “NC” or “NR”.	Page 20
Erratic Roll Sensor reading.	Page 20
BFh reading does not change.	Page 20

Error message: “NC” or “NR”.

Possible Cause	Action	Section
Failed sensor or CANbus.	Test the communication.	3.5

Erratic Roll Sensor reading.

Possible Cause	Action	Section
The Roll Sensor reading is erratic and not stable when the boom is stable.	Ensure the Roll Sensors are mounted correctly.	4.5
	Replace the Roll Sensor.	4.8.2

BFh reading does not change.

Possible Cause	Action	Section
If the BF Roll Sensor is not mounted correctly to the boom frame you will not see any change in the BFh value when the boom rolls over.	Ensure the Roll Sensors are mounted correctly.	4.5
The Roll Sensor serial numbers are not mapped to the correct locations.	Ensure the correct serial number is entered for each Roll Sensor location.	4.10
Faulty Roll Sensor.	Replace the Roll Sensor.	4.8.2

3.2.2 Enhanced Stability

1. Perform a visual check of the sensors to look for any physical damage or improper mounting. Refer to **Section 4.6** for proper Roll Sensor mounting techniques.
2. Navigate to the Roll Sensor reading of the BF, IF and RF roll sensors (from the run screen press “Sensor Display” until “More?”->press “Yes”->press “Sensor Display” until “Roll”->press “Yes”->press “Sensor Display” until “BFh”, “IFh” or “RFh”).
3. When the boom is stable, the BFh, IFh and RFh readings should be stable within a maximum of 10 points.
4. While viewing the BFh reading, with an assistant, push down on the boom tip on one side, hold for a second and let go. You should see a continuous change in the BFh reading.

Note: If you do not have someone else to help you push the boom down you can try manually lifting one boom to force the center section to roll slightly.

5. Ensure the Roll sensors are mounted with highest serial number on the reference frame (RF), middle serial number on the boom frame (BF), and the lowest serial number on the intermediate frame (IF).

Refer to the following sections for troubleshooting if you experience any of the following errors:

Error message: “NC” or “NR”.	Page 22
Erratic Roll Sensor reading.	Page 22
BFh reading does not change.	Page 22

Error message: “NC” or “NR”.

Possible Cause	Action	Section
Failed sensor or CANbus.	Test the communication	3.5

Erratic Roll Sensor reading.

Possible Cause	Action	Section
The Roll Sensor reading is erratic and not stable when the boom is stable.	Ensure the Roll Sensors are mounted correctly.	4.6
	Replace the Roll Sensor.	4.8.3

BFh reading does not change.

Possible Cause	Action	Section
If the BF Roll Sensor is not mounted correctly to the boom frame you will not see any change in the BFh value when the boom rolls over.	Ensure the Roll Sensors are mounted correctly.	4.6
The Roll Sensor serial numbers are not mapped to the correct locations.	Ensure the correct serial number is entered for each Roll Sensor location.	4.11
Faulty Roll Sensor.	Replace the Roll Sensor.	4.8.3

3.2.3 Active Roll™

1. Perform a visual check of the sensors to look for any physical damage or improper mounting. Refer to **Section 4.7** for proper Roll Sensor mounting techniques.
2. Ensure the sprayer and center section of the boom is level.
3. View the Roll Sensor readings of the BF and IF Roll Sensors (from the run screen press “Sensor Display” until “More?”->press “Yes”->press “Sensor Display” until “Roll”->press “Yes”->press “Sensor Display” until “BFh” or “IFh”).
4. When the sprayer and boom are level the BFh and IFh readings should be zero. If they are not, then zero the roll readings.
5. While viewing the BFh reading, press the roll CW switch on the sprayer to manually roll the boom over to one side. You should see a continuous change in the BFh reading without any “NR” errors.

Note: At the very extreme roll position the roll sensor might display some “NR” errors, this is normal.

6. Manually roll the boom over to the other side. You should see a continuous change in the BFh reading without any “NR” errors.

Refer to the following sections for troubleshooting if you experience any of the following errors:

Error message: “NR”.	Page 24
Error message: “NC”.	Page 25
Inaccurate or erratic roll reading.	Page 25

Error message: “NR”.

Possible Cause	Action	Section
The sensor may be saturated with water.	Allow the sensors to dry out. You can also remove the sensor foams, squeeze the water out of them and reinstall them into the sensors. The system can be left running while the sensors dry out.	N/A
The sensor may be covered in mud or debris.	The sensor foams are designed to keep mud and debris off of the sensor transducer. If the sensor foams become dirty you can replace them or remove them from the sensor, clean them and reinstall them into the sensors. If the transducer becomes dirty you can gently wash it out with clean water. Do not use any high pressure water or chemicals on the transducer.	N/A
The rods may not be aligned correctly.	Check the Active Roll™ Sensor mounting.	4.7
If the sensor is still reporting “NR” errors then it may be a faulty transducer or sensor.	Replace the sensor or send it to Norac for repair.	4.8.4

Error message: “NC”.

Possible Cause	Action	Section
Failed sensor or CANbus	Test the communication	3.5

Inaccurate or erratic roll reading.

Possible Cause	Action	Section
The Active Roll™ Sensor may not be configured or calibrated correctly.	When the sprayer and boom center section are level the BFh and IFh readings should be zero. Check the Roll Sensor configuration and calibration.	4.12
The rods may not be aligned correctly.	Check the Active Roll™ Sensor mounting.	4.7
Faulty sensor.	Replace the Roll Sensor.	4.8.4

3.3 Temperature Sensor Test

1. Check the valve block temperature sensor reading. From the run screen, press and hold "SETUP" to cycle the display between the valve block temperature "VT" and the air temperature "AT".
2. If the units are set to metric (cm height), the temperature units will be Celsius. If the units are set to imperial (inch height), the temperature units will be Fahrenheit.
3. The temperature reading is the surface temperature of the valve block. It should be reasonably close to the hydraulic oil temperature and should change as the sprayer warms up.

Incorrect temperature reading

Possible Cause	Action	Section
The temperature sensor is not mounted correctly	The temperature probe is the black cable extending from the Roll Sensor with a ring terminal on the end of it. It must be mounted to the surface of the Norac valve block as outlined in the installation manual. This cable is not a ground connection.	N/A
The Roll Sensor may not be communicating.	Test the Roll Sensor	3.2
Faulty Roll Sensor.	Replace the Roll Sensor.	4.8

3.4 Power Supply Test

The UC4+™ system can be powered using different power supply cables. Refer to your height control installation manual for a description and schematic of the power supply cable.

The Control Panel display will be illuminated and show characters on the screen if the power switch is on and there is system power. To properly check the power supply you should measure the voltage as described below.

Note: Some configurations incorporate the fuse into the battery cable, and some configurations utilize the existing fuse in the sprayer's electrical system.

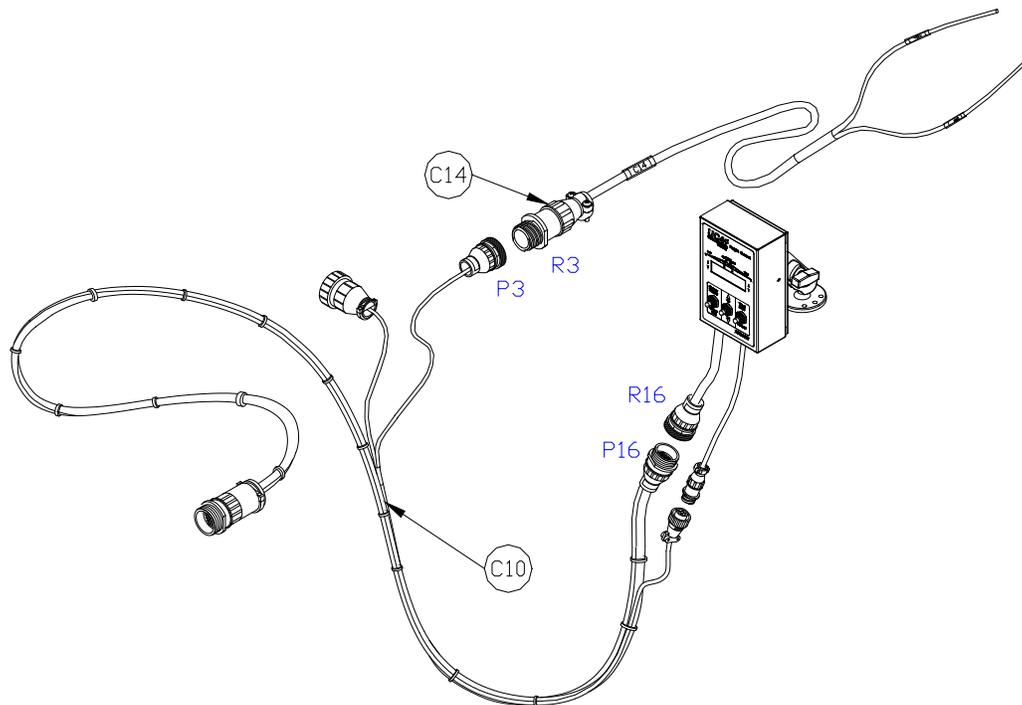
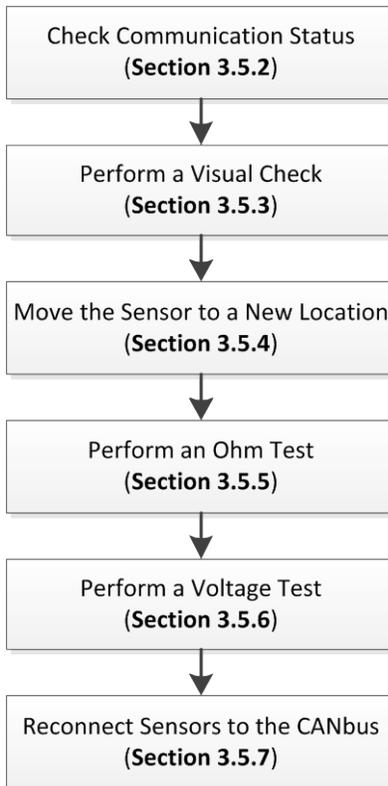


Figure 2: Typical UC4+ Power Supply Configuration

1. Measure the voltage between pin 3 (GND) and pin 1 (+12 VDC) on connector R3. The reading should be +12 VDC
2. Measure the voltage between pin 1 (GND) and pin 5 (+12 VDC) on connector P16. The reading should be +12 VDC

3.5 Communication Test

3.5.1 Troubleshooting the CANbus



*Note: **Section 3.5.8** contains schematics and an overview of the CANbus system.*

3.5.2 Checking Communication Status

Use the methods below to determine if you have any sensors that are not communicating. If you determine that there are communication problems then start testing the CANbus as described in **Section 3.5.3**.

You must ensure that the sensors have all been configured in the system by previously going through an Auto Setup or Quick Setup. If they have not been initially configured they will not show up on the CANbus.

1. Error indicator screens:

“NC” (no communication) error messages will appear on the main run screen at the time of the error if there are any sensors that are not communicating.

The system will also check the communication status of all the sensors on power up. If any of the sensors are not communicating it will show “X” Absent, where “X” is the number of sensors not communicating.

2. Sensor configuration menu:

1. Navigate to the sensor configuration menu (from the run screen press “Sensor Display” until “More?”->press “Yes”->press “Sensor Display” until “Left”->press “Yes”->press “Sensor Display” until “LOht”).
2. The screen will show the current reading of the Left Outer Height Sensor. If the sensor is not communicating it will show “NC”.
3. Repeat this for all of the applicable sensors:
 - Left: LOht, LIht
 - Right: ROht, RIht
 - Main: MLht
 - Roll: BFh, IFh, RFh

3.5.3 Visual Check

Before diagnosing any communication problems, start by performing a visual check of all the CANbus cabling. The majority of communication problems are related to damaged cabling that may have been installed incorrectly. Look for any pinched or stretched cables especially near the boom pivot points such as the main lift and fold points. Ensure all the connectors are free of corrosion, clean and plugged in.

Note: Dielectric grease must never be used on any of the CANbus connections.

3.5.4 Moving the Sensor to a New Location

If there is only one sensor that is not communicating, you can try removing the sensor from its current location and plugging it into another CANbus connector. This step is not required, however it is useful to quickly diagnose a problem if only one sensor is not communicating.

1. Power down the system.
2. Unplug the non-communicating sensor from the CANbus.
3. Plug the sensor into a connector that previously had a known communicating sensor.
4. Turn on the power.
5. Check if the sensor is now communicating. *Note: The sensor will still be assigned to its previous location. For example, if you moved the left outer sensor to the right outer location, the left outer sensor will still show up as the left outer sensor. The controller will not know that you have moved the sensor.*
6. If the sensor now communicates then it would indicate that there is a problem with the cable that it was previously connected to.
7. If the sensor still does not communicate then it would indicate a problem with the sensor itself.

3.5.5 Ohm Test

1. The following test will check for any short circuits in the cabling.
2. Disconnect all the height sensors and roll sensors from the CANbus. *Note: If you are also removing the sensors from their mounting brackets, ensure you write down the serial number and location of each sensor so it can be installed back in its previous location.*
3. There are two connectors on the UC4+™ Control Panel. The 4-pin Amp connector (P4) is the CANbus. Disconnect “P4” from the Control Panel. (**Figure 3**).

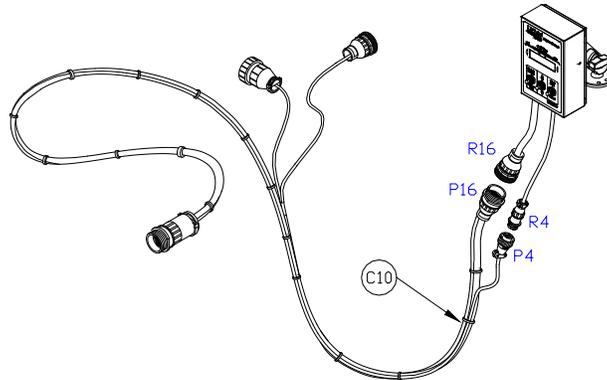


Figure 3: Typical Control Panel Installation

4. Using an ohm meter, test the resistance of every pin combination on connector P4 as shown in **Figure 3** and Test Point I (TPI) **Figure 8**. The pin numbers are labeled inside the connector. The following table lists the values for each pin combination.

Pin #	Pin #	Value
1	2	Open Circuit
1	3	Open Circuit
1	4	Open Circuit
2	3	Open Circuit
2	4	75 Ω ± 10 Ω
3	4	Open Circuit

Figure 4: Typical Norac Bus Ohm Test Values

5. If you measured differently than the values in **Figure 4**, continue by testing at the next connection towards the rear of the sprayer (Test Point 2, 3, 4, etc - **Figure 8**) until you isolate the problem cable.

3.5.6 Voltage Test

1. The following test will check for continuity in the cabling.
2. Ensure the height sensors and roll sensors are still disconnected from the CANbus.
3. Reconnect the 4-pin Amp connector (P4) to the Control Panel. (**Figure 3**).
4. Using a voltmeter, measure the voltage of the following pin combinations at each of the sensor connections (Test Point 4, 5, 7, 8 and 9 - **Figure 8**).

Pin #	Pin #	Value
1	2	0.5 to 6 VDC
1	3	12 ± 3 VDC
1	4	0.5 to 6 VDC

Figure 5: Typical Norac Bus Voltages

5. If you measured differently than the values in **Figure 5**, continue by testing at the next connection towards the front of the sprayer (Test Point 6, 3, 2, 1 etc - **Figure 8**) until you isolate the problem cable.

3.5.7 Reconnect Sensors to the CANbus

Once you have confirmed the CANbus cabling is ok by performing the Ohm Test and Voltage Test, you can start reconnecting the sensors one at a time to the CANbus to ensure each sensor is communicating.

1. Reconnect one sensor to the CANbus.
2. Check if the sensor is communicating.
3. If the sensor is not communicating then remove it from the CANbus and set it aside to be replaced.
4. If the sensor is communicating then leave it connected to the CANbus.
5. Repeat steps 1 to 4 for each of the sensors until they are all connected to the CANbus. Replace any sensors that do not communicate.

3.5.8 CANbus Overview

The NORAC UC4+ CANbus consists of four wires that are connected to all of the sensors in the system (Ground, +12 VDC, CAN+ and CAN-). The sensors and the control panel all communicate with each other via the CANbus. The controller knows where each sensor is located by its serial number and not by the physical location that it is plugged into. **Figure 6** shows a simplified schematic of the network cable.

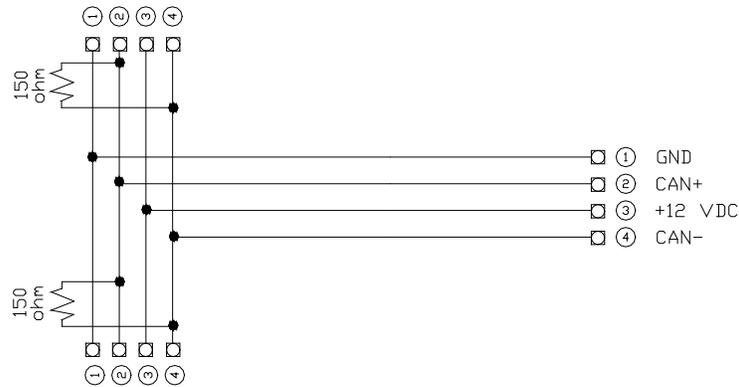


Figure 6: Simplified Network Schematic

The CANbus has two 150 Ω termination resistors incorporated into the connector that plugs into each of the outer height sensors at the wing tips (**Figure 7**). The two termination resistors are in parallel for a total termination resistance of 75 Ω .

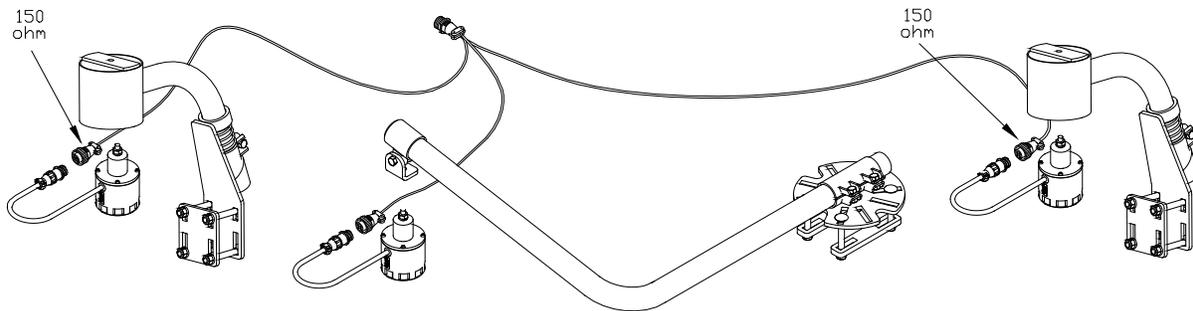


Figure 7: Location of Termination Resistors

Figure 8 shows a typical system layout with test points labeled for troubleshooting as described earlier in this section. Please refer to the installation manual for your sprayer type for your exact system layout.

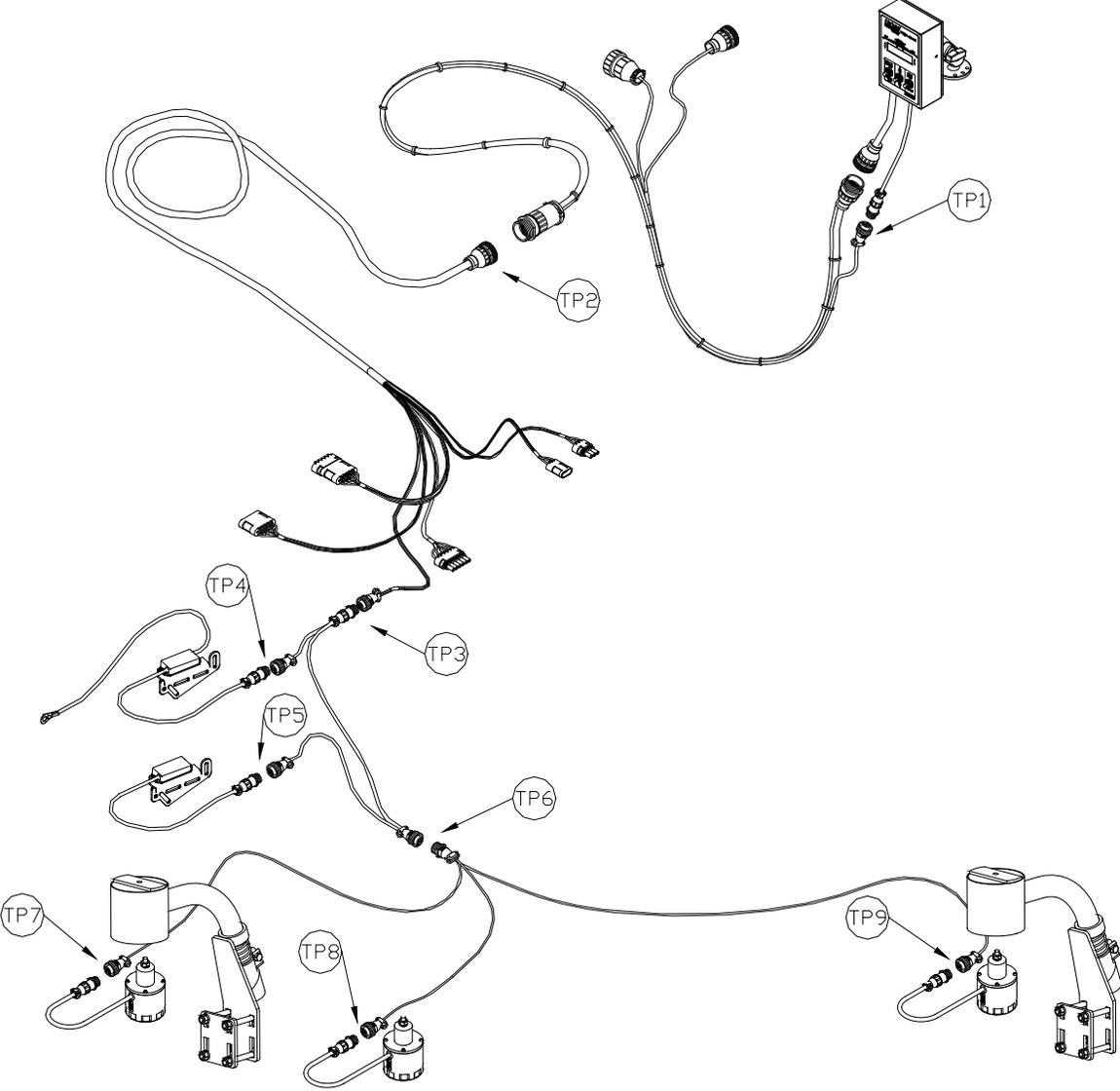


Figure 8: Test Point (TP) Examples

3.6 Boom Functions Test

Important: While performing this test the boom functions will move at 100% speed for one second. Ensure the sprayer booms have full range of movement.

By performing the following boom functions test you will confirm that the UC4+™ system is able to drive the corresponding boom functions. This will confirm that the electrical and hydraulic portions of the UC4+™ boom function outputs are operating correctly.

1. Navigate to the “Left Up Gain” screen in the “Setup” menu (from the run screen press “Setup” until “More?->press “Yes”->press “Setup” until “Left”->press “Yes”->press “Setup” until “↑KP”)
2. Press and hold the “Manual” switch.
3. The controller will drive the selected function for 1 second at 100%.
4. Ensure the “Left Up” boom function operates.
5. Repeat steps 1 to 4 for all the other boom functions: “Left Down”, “Right Up”, “Right Down”, “Main Up”, “Main Down”, “Roll Clockwise” and “Roll Counter Clockwise”.

Note: Not all sprayer types will have all the functions listed above. Refer to the UC4+™ installation manual for your sprayer type to determine which functions your system supports.

Refer to the following sections for troubleshooting if you experience any of the following errors:

The wrong boom function moves.	Page 36
One or more of the on/off functions do not operate.	Page 36
One of the proportional boom functions does not operate.	Page 37
More than one proportional boom function does not operate.	Page 37

The wrong boom function moves.

Possible Cause	Action	Section
For proportional functions; the valve cable may not be correctly installed.	Check the valve cable and interface cable installation. Refer to your installation manual.	N/A
For on/off functions; the interface cable may not be correctly installed.	Test the valve drivers.	3.8
For proportional functions; the raise and lower lines from the Norac valve block may not be correctly installed.	Check the hydraulics installation. The raise lines must be connected to the “B” ports and the lower lines must be connected to the “A” ports.	N/A
	Perform a manual valve override test.	3.7

One or more of the on/off functions do not operate.

Possible Cause	Action	Section
The outputs may not be correctly configured.	If you have not completed an Automatic Setup then complete it now.	4.2
The interface cable may be damaged or a valve driver in the Control Panel may have failed	Test the valve drivers.	3.8
The deadzone value may be set close to zero.	Check the deadzone setting.	3.12.1

One of the proportional boom functions does not operate.

Possible Cause	Action	Section
The outputs may not be correctly configured.	If you have not completed an Automatic Setup then complete it now.	4.2
The valve cable may be damaged or a valve driver in the Control Panel may have failed.	Test the valve drivers	3.8
The coil may have failed.	Try swapping valve coils with another valve that is known to work correctly. If this solves the problem then replace the failed coil.	N/A
The hydraulics may have failed.	Perform the manual valve override test.	3.7
The deadzone value may be set close to zero.	Check the deadzone setting.	3.12.1

More than one proportional boom function does not operate.

Possible Cause	Action	Section
The outputs may not be correctly configured.	If you have not completed an Automatic Setup then complete it now.	4.2
The Norac hydraulic valve block may not be receiving hydraulic pressure. This may be caused by the bypass/jam valve cable or load sense line not being installed correctly.	Repeat the boom function test while pressing and holding another function on the sprayer joystick such as an unfold function. This will activate the bypass/jam valve. If the boom functions move now, then the bypass/jam valve wiring or load sense is not installed correctly.	3.6
The valve cable or a valve driver may have failed.	Test the valve drivers.	3.8
The pressure and tank lines may not be installed correctly.	Perform the manual valve override test for each valve to confirm the hydraulics is operating correctly.	3.7
The deadzone value may be set close to zero.	Check the deadzone setting.	3.12.1

3.7 Manual Valve Override Test

Important: While performing this test the boom functions will move. Ensure that you are located in a safe position as to not get injured from any boom movements.

The manual valve override test is useful for determining if the hydraulics are operating correctly on the Norac valve block.

1. If your sprayer has a bypass or jam valve you will need to active it at the same time as performing this test for the Norac valve to receive hydraulic pressure. One option is to have an assistant press and hold an unfold function while you are performing this test.
2. Perform the manual override test for each proportional function by pushing in the pin with a small screwdriver or awl in the center of the coil as shown in **Figure 9** or **Figure 10**.
3. The corresponding boom function should move when you perform this test.

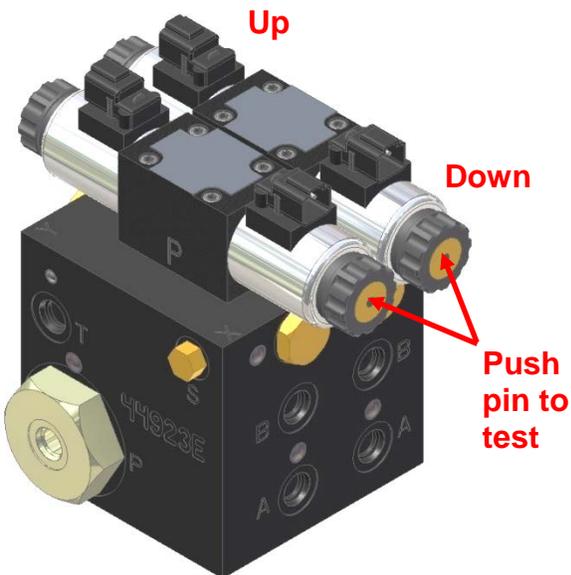


Figure 9: Manual Valve Override Test
(early model valve block)

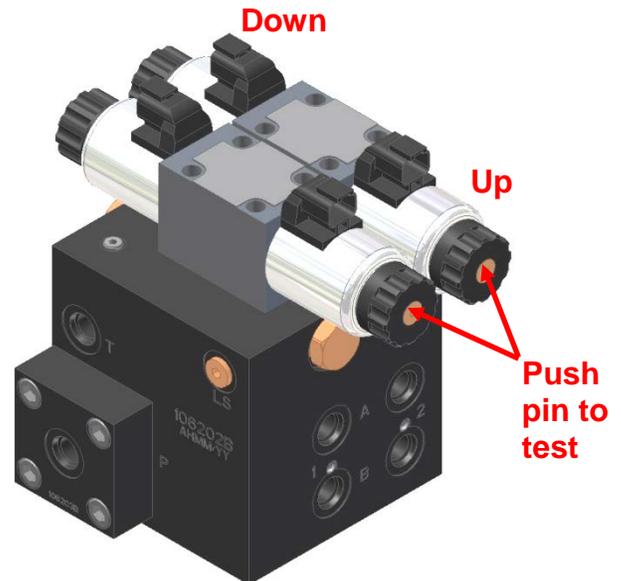


Figure 10: Manual Valve Override Test
(later model valve block)

Refer to the following sections for troubleshooting if you experience any of the following errors:

The wrong boom function moves.

Page 39

One of the boom functions do not operate.

Page 39

More than one boom functions do not operate.

Page 39

The wrong boom function moves.

Possible Cause	Action	Section
For proportional functions; the raise and lower lines from the Norac valve block may be incorrectly installed.	Check the tilt cylinder hose installation. The raise lines must be connected to the “B” ports and the lower lines must be connected to the “A” ports. Refer to your installation manual for correct hydraulic installation.	N/A

One of the boom functions do not operate.

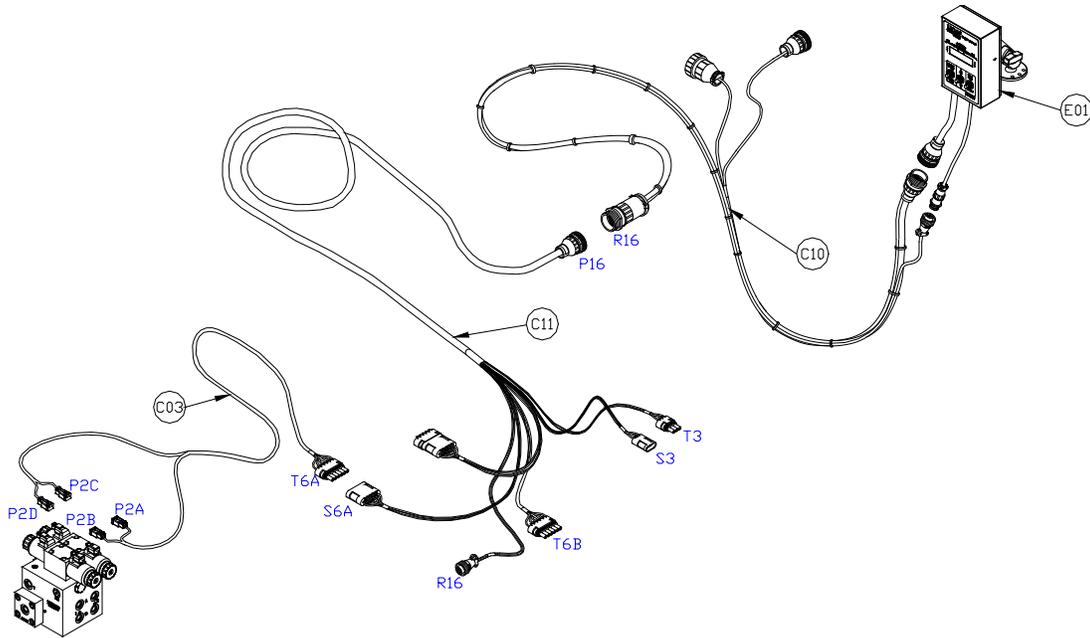
Possible Cause	Action	Section
Debris in the valve or valve block.	Check the valve and valve block for debris.	N/A

More than one boom functions do not operate.

Possible Cause	Action	Section
The Norac hydraulic valve block may not be receiving hydraulic pressure. This may be caused by the bypass/jam valve cable or load sense line not being installed correctly.	Ensure the bypass / jam valve is being activated while performing the manual valve override test.	N/A
	If you have a load sense connection, ensure it is correctly installed. Refer to your installation manual for correct installation.	N/A
The pressure and tank lines may not be installed correctly.	Check the pressure and tank lines. Refer to your installation manual for correct installation.	N/A
Debris in the valve or valve block.	Check the valve and valve block for debris.	N/A

3.8 Valve Driver Test

Figure 11 shows the typical cabling for the valve drive outputs. Refer to your installation manual for complete schematics.



Function	Connector	Pin #	Ground Pin #
Left Up	P2B	1	2
Left Down	P2D	1	2
Right Up	P2A	1	2
Right Down	P2C	1	2
Main Up	T6B	A	N/A
Main Down	T6B	B	N/A
Roll CW ¹	S3	A	B
Roll CCW ¹	S3	C	B

Figure 11: Default Valve Drive Outputs

*Note 1: Not all sprayer types will have the functions listed in the table in **Figure 11**.*

1. Disconnect the valve cables from each coil.
2. Attach a test light or voltmeter to the cable labeled “Left Up” (Connector P2B). You may need to remove the wedge lock on the connector to attach your probe to the pin.
3. Navigate to the “Left Up Gain” screen in the “Setup” menu (Run Screen-> toggle “Setup” until “More?->toggle “Yes”->toggle “Setup” until “Left”->toggle “Yes”->toggle “Setup” until “↑KP”)
4. Press and hold the “Manual” switch. The controller will drive the selected function for one second at 100%. You should get a +12 VDC reading on your voltmeter.
5. Repeat steps 1 to 3 for all the other boom functions: “Left Down”, “Right Up”, “Right Down”, “Main Up”, “Main Down”, “Roll Clockwise” and “Roll Counter Clockwise”.

One or more of the functions does not operate.

Possible Cause	Action	Section
Damaged valve cables.	Repeat this test for the failed output channel. Systematically test the output while working your way back to the Control Panel to find the faulty cable. Refer to your installation manual for cable schematics.	3.8
Failed Control Panel drivers.	Replace the Control Panel	4.8.5

3.9 Switch Inputs Test

This test will confirm if the sprayer switches are correctly connected to the UC4+™ system.

1. Navigate to the main run screen.
2. Press the left up sprayer switch.
3. Ensure the left up arrow is shown on the screen.
4. Repeat Steps 2 and 3 for all the other boom functions: “Left Down”, “Right Up”, “Right Down”, “Main Up”, “Main Down”, “Roll CW” and “Roll CCW”.

Note: Not all sprayer types will have all the functions listed above. Refer to the UC4+™ installation manual for your sprayer type to determine which functions your system supports.

Wrong input detected.

Possible Cause	Action	Section
The UC4+™ interface cable may not be correctly installed.	Refer to the installation manual for correct installation instructions.	N/A

The corresponding arrow does not show up on the display.

Possible Cause	Action	Section
The UC4+™ interface cable may not be connected correctly to the sprayer’s wiring harness.	Refer to the installation manual for correct installation instructions. Use a test light or voltmeter to confirm you have the correct connections.	N/A
There is no output from the sprayer wiring harness when the corresponding switch is pressed.	Confirm that there is a 12 VDC output from the sprayer wiring harness that connects to the UC4+™ interface cables. Refer to the installation manual for electrical schematics.	N/A
The UC4+™ interface cable may be damaged.	Systematically test the continuity of the cable while working your way back to the Control Panel. Refer to your installation manual for cable schematics.	N/A
The Control Panel may have failed.	Replace the Control Panel	4.8.5

3.10 Boom Speed Test

Important: While performing this test the boom functions will move at 100% speed for 1 second. Ensure the sprayer booms have full range of movement.

1. Ensure the sprayer is at operating temperature and RPM. Turn on the solution pump if possible.
2. Navigate to the “Left Up Gain” screen in the “Setup” menu (from the run screen press “Setup” until “More?->press “Yes”->press “Setup” until “Left”->press “Yes”->press “Setup” until “↑ KP”)
3. Press and hold the “Manual” switch.
4. The controller will drive the selected function for 1 second at 100% and report the distance travelled. This is the boom speed.
5. Repeat this test a few times to get an average boom speed reading.
6. Repeat Steps 3 to 5 for the “Left Down”, “Right UP” and “Right Down” functions.

Function	Min	Units
Left Up	20	inches / sec
	500	mm / sec
Right Up	20	inches / sec
	500	mm / sec
Left Down	10	inches / sec
	250	mm / sec
Right Down	10	inches / sec
	250	mm / sec

Figure 12: Typical Booms Speeds

The boom speed is outside of the specified range.

Possible Cause	Action	Section
The orifices in the Norac valve block may have been installed backwards or may not be seated correctly.	Check the orifice installation in the “A” and “B” ports. Ensure they have been installed with the correct orientation. Refer to your installation manual.	N/A
There may be air in the hydraulic lines.	Cycle the wings up and down several times to remove the air out of the hydraulic system.	N/A

3.11 Checking Mechanical Components

The following list describes several mechanical items to check on your sprayer. For optimum performance these recommendations should be followed. Please note that this list does not apply to all sprayer types. Please follow the recommendations that apply to your sprayer.

3.11.1 General

Friction Pads:

Ensure the boom pivots freely. If there are friction pads on the boom, ensure they are well greased or clean and free from debris. The friction pads must be adjusted properly to allow the boom to pivot freely and not stick or bind as the boom rolls.

Main Lift:

If there is substantial wear in the mast-style main lift the boom will be too loose. Install shims or adjust the mast-style main lift if possible.

Accumulators:

If the sprayer has accumulators on the wing tilt cylinders, they should have orifices (restrictors) installed between the accumulator and the hydraulic circuit. The orifices are used to restrict the amount of effect the accumulators have on the hydraulic circuit. NORAC recommends 1mm to 1.5 mm restrictors.

All Accumulators (main lift and tilt) must be charged to their recommended setting.

Boom Suspension:

Ensure the sprayer's boom suspension is operating correctly and moving freely. If the suspension is sticking or too loose, the boom will be unstable. If the boom is unstable in manual mode, the height control system will not make it more stable.

For optimal performance the boom suspension should be "critically damped". **Figure 13** illustrates how to check if the boom is critically damped.

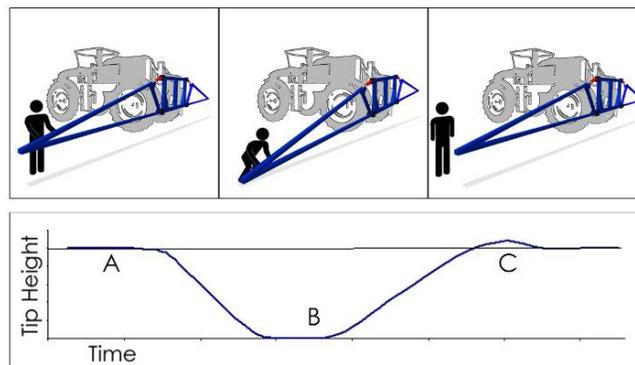


Figure 13: Critically Damped Boom

If the boom is not critically damped then check the boom damper shocks and replace them if they are worn. If the suspension is adjustable then adjust it so the boom is critically damped.

3.11.2 Active Roll™ Systems (John Deere)

If you have a John Deere Active Roll™ System, check these additional items.

Rod Alignment:

Check the rod alignment as described in the Active Roll™ Sensor mounting (**Section 4.7**).

Secondary Pressure and Tank Lines:

Ensure the secondary pressure and tank lines have been installed. Without the secondary pressure and tank lines the Spray Height Control System will operate, but it will not perform to its full capabilities due to slower boom speeds. Refer to the installation manual for installation instructions.

Roll Cylinder Mounts:

Ensure there is no free movement in the top roll cylinder mount. Check the mounting bolts on the cylinder and ensure they are tight. A common problem is that the top hole where the roll cylinder mounts will become loose and eventually oblong. This allows the cylinder to move without actually moving the boom. It is recommended that this pin always be welded to prevent the hole from wearing. If the pin is welded, inspect the weld for cracking.

If there is free movement on any of the other cylinder mounts, they should have gussets added or spacers added to provide more strength and reduce free movements of the cylinder.



Figure 14: Roll Cylinder Mounts

Ensure the top roll cylinder pin does not bind on the boom frame as shown in **Figure 15**.

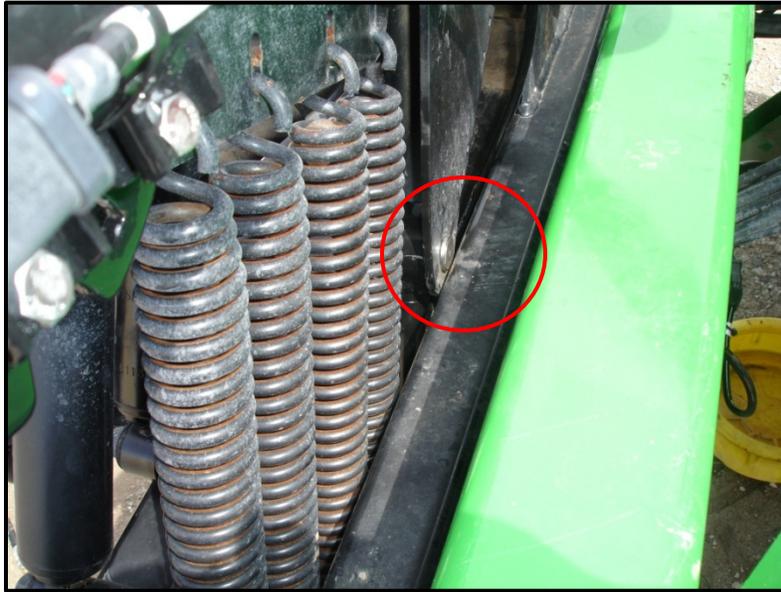


Figure 15: Example of Roll Cylinder Pin Binding

Main Pivot Bearing:

Check for wear on the main pivot bearing. The bearing can come loose and move out of place. It is essential that this bearing remain tight and be inspected for proper pivot.

Loose bearing can move freely

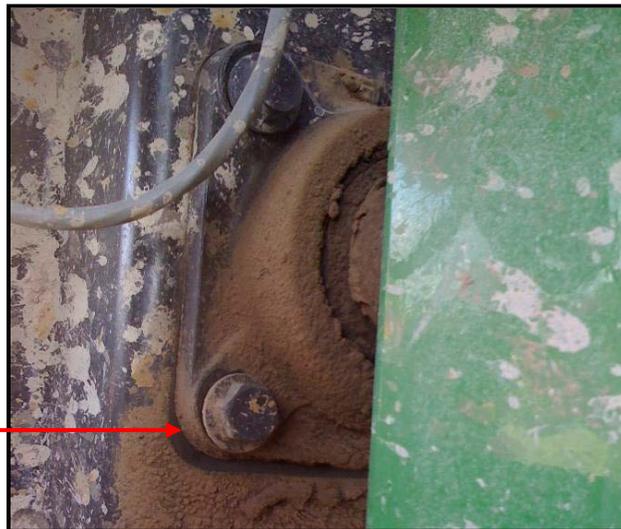


Figure 16: Pivot Bearing with Free Movement

Rubber Bumpers:

Ensure the rubber bumpers have been removed. When installing the Active Roll™ section, the rubber bumpers that are mounted between the boom and black tee frame must be removed. If these are not removed; when a severe correction is required the boom can roll hard and bounce off the rubber bumper. When the boom bounces off it causes the system to start to oscillate.



Figure 17: Rubber Bumpers Removed

Spring Adjustment:

Proper spring adjustment is important to make sure the boom can properly center. The springs can be adjusted on a John Deere sprayer by adjusting the spring tensioners located on the boom. There are two tensioners, one for each side. The correct adjustment is with the boom level, the measurement between the spring mounting holes should be between 405 and 420 mm (16 and 16.5”).



Figure 18: Spring Tensioner Location

3.12 Checking Settings

The following section describes how to check the most common settings on the UC4+™ system. If you have not yet completed an Automatic Setup then perform it now before continuing.

3.12.1 Deadzones

1. Navigate to the hydraulic setup menu (Run Screen->toggle “Setup” until “More?”->toggle “Yes”-> toggle “Setup” until Left, Right etc..->toggle “Yes”).
2. The left channel menu prompts are shown below. For other channels, the basic structure and behavior of the prompts is the same.
3. To return to the Run Screen, press and hold the "Setup (No)" or “Sensor Display” switch for two seconds.

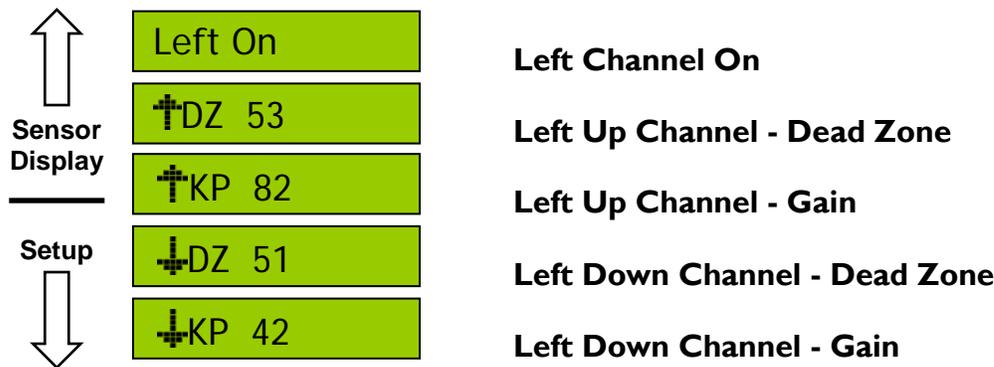


Figure 19: Hydraulic Setup Menu (for Left Channel)

The deadzone value relates to the smallest amount of boom movement the valve can produce. Typical deadzone values for UC4+™ are as follows:

Function	Valve Type	Typical	Min	Max
Wings	Proportional	50	40	65
Main Lift	Proportional	50	25	100
Main Lift	On / Off	N/A	N/A	N/A
Roll	Proportional	50	25	100
Roll (Slant)	On / Off	N/A	N/A	N/A

Figure 20: Typical Deadzone Values

If the deadzone value is outside of the specified range or to confirm if it has been calibrated correctly, calibrate the deadzone as described in **Section 4.13.1**.

3.12.2 Gains

1. Navigate to the hydraulic setup menu (Run Screen->toggle “Setup” until “More?”->toggle “Yes”-> toggle “Setup” until Left, Right etc..->toggle “Yes”).
2. The left channel menu prompts are shown below. For other channels, the basic structure and behavior of the prompts is the same.
3. To return to the Run Screen, press and hold the "Setup (No)" or “Sensor Display” switch for two seconds.

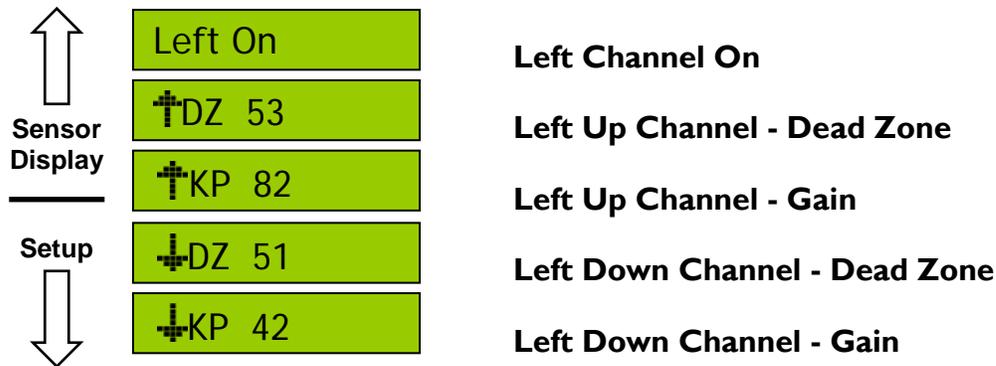


Figure 21: Hydraulic Setup Menu (for Left Channel)

The gain value relates to the maximum speed of the boom. This value is dependent on the sprayer type and therefore can be quite different for each sprayer type.

When checking gain values the left up and right up gain value should be close (within 20). The left down and right down values should also be close (within 20) and are typically half of the up value for most sprayer types. Generally the faster the boom speed the lower the gain value.

Function	Valve Type	Typical	Min	Max
Wings (up)	Proportional	80	10	200
Wings (down)	Proportional	40	5	150
Main Lift	All	N/A	N/A	N/A
Roll	Proportional	N/A	N/A	N/A
Roll (Slant)	On / Off	10	1	40

Figure 22: Typical Gain Values

If the gain value is outside of the specified range or to confirm if it has been calibrated correctly, calibrate the gain as described in **Section 4.13.2**.

3.12.3 Boom Geometry Values

To view the Boom Geometry Values, press and hold "MANUAL" from the run screen. The screen will appear as shown below.

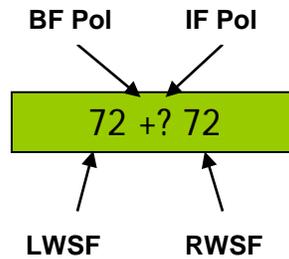


Figure 23: Boom Geometry Values

The boom geometry values relate to the position of the Roll Sensors, boom type and position of the Height Sensors. The left (LWSF) and right (RWSF) values should normally be very close (within 10).

For sprayers which have 2 roll sensors installed with the cable facing the right hand wing, the polarity will show "+ ?" until the sprayer has turned a corner or driven over a bump. After the system has detected the IF polarity it will show "+ -".

Boom Type	LWSF (Typical)	RWSF (Typical)	Min	Max
Center Pivot	80	80	40	200
High Pendulum	80	80	40	200
Trapeze	30	30	10	60
Rigid	30	30	10	60

Roll Sensor Type	Orientation	BF Polarity	IF Polarity
Passive Roll	Cables facing right hand side	POS	NEG
Passive Roll	Cables facing left hand side	NEG	POS
Active Roll™ (JD)	Rods on right hand side	NEG	NEG
Active Roll™ (JD)	Rods on left hand side	POS	POS
Active Roll™ (LRC)	Right hand side	NEG	NEG
Active Roll™ (LRC)	Left hand side	POS	POS

Figure 24: Typical Boom Geometry Values

If the boom geometry values are incorrect or to confirm if they have been calibrated correctly, calibrate the boom geometry as described in **Section 4.14**.

3.12.4 Sensitivity

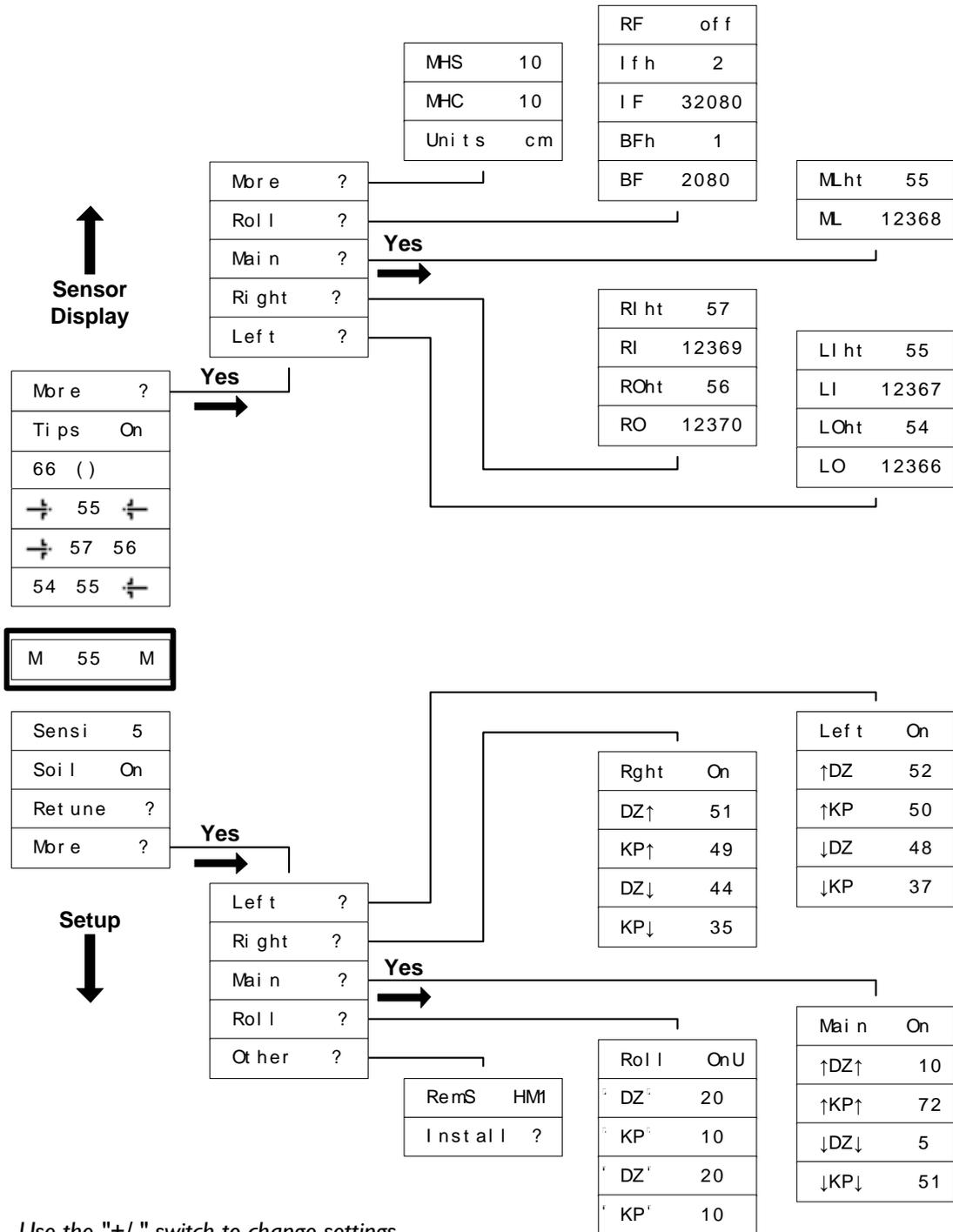
1. From the Run Screen, press “Setup” once.
2. The sensitivity can be adjusted from 1 to 10, with 5 being the default setting. A lower number will reduce the system sensitivity and improve stability. Higher settings will speed up the response and also create a greater demand on the hydraulics.
3. For testing purposes the sensitivity should be set at the default value of 5. Once you are confident the system is working well then you can test the system at higher sensitivities. Some sprayer types may be unstable at higher sensitivities.

3.12.5 Crop and Soil Mode

1. From the Run Screen, press “Setup” twice.
2. Soil Mode allows the sensors to read a height from the spray nozzles to the ground; whereas Crop Mode will read the height from the spray nozzles to the top of the crop canopy.
3. For testing purposes the system should initially be set to “Soil”. Once you are confident the system is working well in Soil Mode then you can test the system in Crop Mode. For more information on Crop and Soil Mode refer to the UC4+™ Operator Manual.

4 Reference

4.1 Menu Structure Map



Use the "+/-" switch to change settings.

Press and hold "SETUP" or "SENSOR DISPLAY" for two seconds to return to the run screen.

4.2 Automatic System Setup

The following section describes how to perform the Automatic System Setup. For troubleshooting Automatic Setup problems, please refer to **Section 2.5**.

Note: It is not a requirement to default the Control Panel before performing an Automatic Setup.

Preparation:

Unfold the sprayer in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the system setup or retune procedures over standing crop, weeds/grass, wet concrete, water or snow.

Ensure the boom roll suspension system is functioning properly and smoothly.

For best results, the hydraulic system should be under a normal load and at a normal working temperature.

- Start the solution pump and run the sprayer's engine at a normal working RPM for the entire setup.
- Cycle all boom sections up and down manually for five minutes to warm the oil.
- For trailed sprayers, ensure any hydraulic flow controls are adjusted for normal field operation.
- Changing the hydraulic flow controls after or during the system setup will affect the performance.

Starting the Automatic System Setup:

1. Navigate to the Automatic System Setup (Run Screen->toggle "Setup" until "More?"->toggle "Yes"-> toggle "Setup" until "Other?"->toggle "Yes"-> toggle "Setup" until "Install?"->toggle "Yes").
2. Select the sprayer type using the "+/-" switch. The types are listed in **Section 4.16**.
3. When the desired type is shown, confirm the selection with the "Auto (Yes)" switch.
4. If you wish to exit the install now before changing any settings toggle the "Setup (No)" switch.
5. The system will now erase the previous settings and load the default settings for your sprayer type.

Switch Test:

6. The system will instruct you to press the boom function switches on the sprayer controls. Press each switch momentarily as instructed on the terminal.
7. When you press each of the sprayer's switches the system will check if the interface wiring is correctly installed.

Note: If you wish to bypass the Switch Test, toggle "Setup (No)" before you press any switches. Some sprayer types do not support a wiring test or they may support a different style of test. If you do not see any of the messages in this step, simply continue as prompted by the panel.

Sensor Detect:

8. You will be instructed to place your booms so the nozzles are 35" (90cm) from the ground. When the measured distance is 35" (90cm) toggle "Auto (Yes)". At this point the system will calibrate the height of each sensor to 35" (90cm).
9. If you are not able to get the height to exactly 35", you can adjust the offset height (**Section 7**) after the Automatic Setup. You must get the booms reasonably close to 35" or the Automatic Setup may encounter problems.
10. Press and hold "Auto (Yes)" switch to begin the sensor detect procedure. During the procedure you must hold the "Auto (Yes)" switch.
11. If "Auto (Yes)" is released, the system will ask you if you want to "Retry". Toggle "Auto (Yes)" to start the Sensor Detect portion of the Automatic Setup again.
12. The system will now move the left boom and then the right boom to detect and assign the Height Sensor to the correct locations.

Boom Geometry Calibration:

13. Press and hold the "Auto (Yes)" switch. The system will move the booms into position for the boom geometry test.
14. The system will then instruct you to exit the cab and pull the boom tip down towards the ground, and then release the boom.
15. When performing the Boom Geometry Calibration, push the boom down approximately 2 – 3 feet (50 – 100 cm) and then let go of the boom. Do not push the boom tip into the ground when performing this test. Ensure you stay a minimum of 3 feet (1m) away from any of the Height Sensors.

Note: If you wish to bypass the Boom Geometry Calibration toggle the "Setup (No)" switch before you push the boom. The Boom Geometry Calibration may not be applicable for all sprayer types.

Hydraulic Calibration:

16. Hold the “Auto (Yes)” switch and continue holding it until you are instructed to release it. The system will now calibrate the hydraulics.
17. All boom sections will move. If you accidentally release the switch, hold the “Auto (Yes)” switch to resume.
18. The display will show the following calibration messages (if applicable) as it is calibrating the boom.

Message	Function	Parameter	Message	Function	Parameter
↑ DZ	Left Up	Deadzone	DZ ↑	Right Up	Deadzone
↑ KP	Left Up	Gain	KP ↑	Right Up	Gain
↓ DZ	Left Down	Deadzone	DZ ↓	Right Down	Deadzone
↓ KP	Left Down	Gain	KP ↓	Right Down	Gain
↑ DZ ↑	Main Up	Deadzone	↻ DZ ↻	Roll CW	Deadzone
↑ KP ↑	Main Up	Gain	↻ KP ↻	Roll CW	Gain
DZ	Main Down	Deadzone	DZ	Roll CCW	Deadzone
KP	Main Down	Gain	KP	Roll CCW	Gain

Figure 25: Hydraulic Calibration Messages

19. When the setup is finished the display will show “Done”. Your NORAC UC4+™ system is now configured and ready for operation.

4.3 Retune

The following section describes how to perform the Retune. For troubleshooting Retune problems, please refer to **Section 2.5**.

Preparation:

Unfold the sprayer in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the Retune over standing crop, weeds/grass, wet concrete, water or snow.

Ensure the boom roll suspension system is functioning properly and smoothly.

For best results, the hydraulic system should be under a normal load and at a normal working temperature.

- Start the solution pump and run the sprayer's engine at a normal working RPM for the entire setup.
- Cycle all boom sections up and down manually for five minutes to warm the oil.
- For trailed sprayers, ensure any hydraulic flow controls are adjusted for normal field operation.
- Changing the hydraulic flow controls after or during the system setup will affect the performance.

Starting the Retune:

1. Navigate to the Retune (Run Screen->toggle "Setup" until "Retune?"->toggle "Yes").

Hydraulic Calibration:

1. Hold the "Auto (Yes)" switch and continue holding it until you are instructed to release it. The system will now calibrate the hydraulics.
2. All boom sections will move. If you accidentally release the switch, hold the "Auto (Yes)" switch to resume.
3. The display will show messages as it is calibrating the boom. Refer to **Figure 25** for a description of calibration messages.
4. When the setup is finished the display will show "Done".

4.4 Height Sensor Mounting

Height Sensors can be mounted several different ways depending on the sprayer and boom type. The following mounting instructions are intended for general reference only. Your installation manual may contain specific Height Sensor mounting instructions.

Note: By default the controller assigns the serial numbers in order from left to right lowest to highest. If the serial numbers are not in the correct order the controller will reassign them during the Automatic Setup. It is recommended to install the sensors in order for troubleshooting purposes, however it is not necessary.

Height Sensor Mounting Guidelines:

The following rules should be followed for both the wing sensors and the main lift (middle) sensor.

1. In its lowest position, the sensor must be 9 inches (23 cm) or more from the ground (A).
2. The centerline of the acoustic cone should be approximately vertical at normal operating heights (A).
3. The bottom of the sensor must be at least 9 inches in front of the spray nozzles and boom structure (B). This does not apply for the main lift sensor.
4. The bottom of the sensor must be at least 9 inches above the spray nozzles (C).
5. Ensure there are no other obstructions with a 12 inch (23 cm) diameter circle projected directly below the sensor (D).

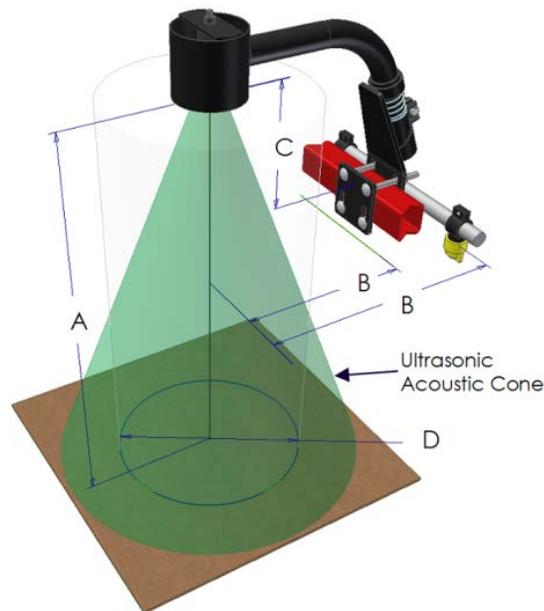


Figure 26: Height Sensor Mounting Guidelines

6. A problem can arise if a sensor is not mounted correctly. It is possible for the sensor to read off of the boom instead of the ground. This may only become apparent once the controller is switched from soil to crop mode (**Figure 27**).



Figure 27: Sensor Reading Off Boom

7. Avoid mounting the main lift sensor over or near a wheel-track. Measurements from the wheel-track do not provide an accurate crop height and will cause measurement and control error.
8. Ensure that there are no hoses or sprayer components that can move underneath the main lift sensor during the full range of the main lift.

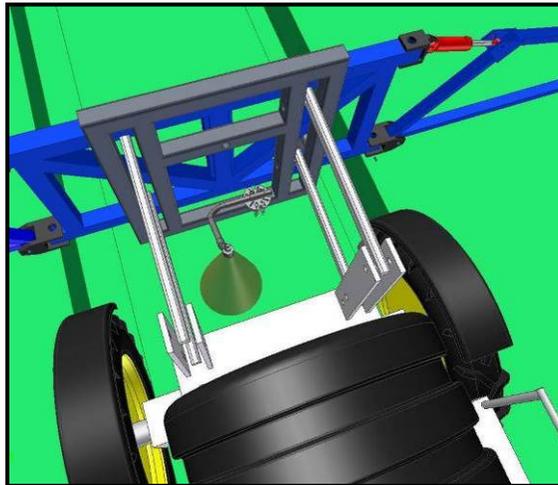


Figure 28: Example Mounting of the Main Lift Sensor

4.5 Roll Sensor Mounting (Passive Roll)

Before installing the Roll Sensors you must determine if your sprayer has a trapeze style, center pivot style or high pendulum style boom.

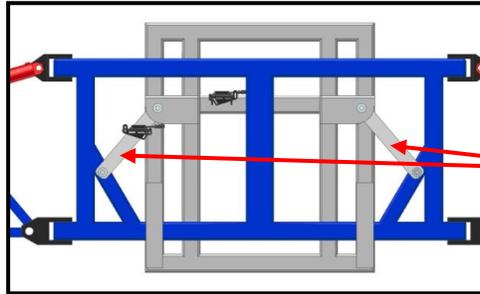


Figure 29: Trapeze Style Boom

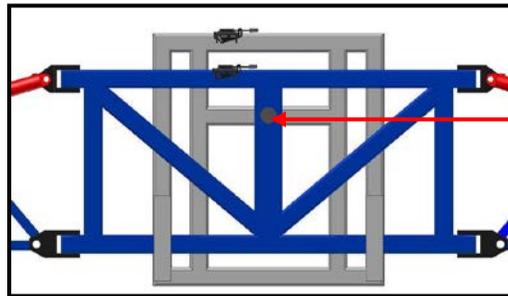


Figure 30: Center Pivot Boom

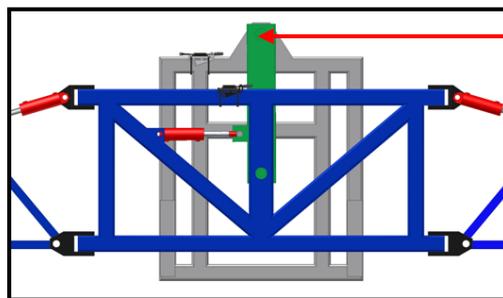


Figure 31: High Pendulum Boom

4.5.1 Trapeze-Suspended Booms

1. Mount the Roll Sensor with the temperature probe to the trapeze support (chassis) and the other to the trapeze link (boom frame).
2. For optimal performance, minimize the distance from the Roll Sensors to the pivot point (A & B).
3. Ensure the Roll Sensors are relatively level when the sprayer boom and chassis are level.
4. Both Roll Sensor CANbus cables should be pointing towards the right hand wing of the sprayer.

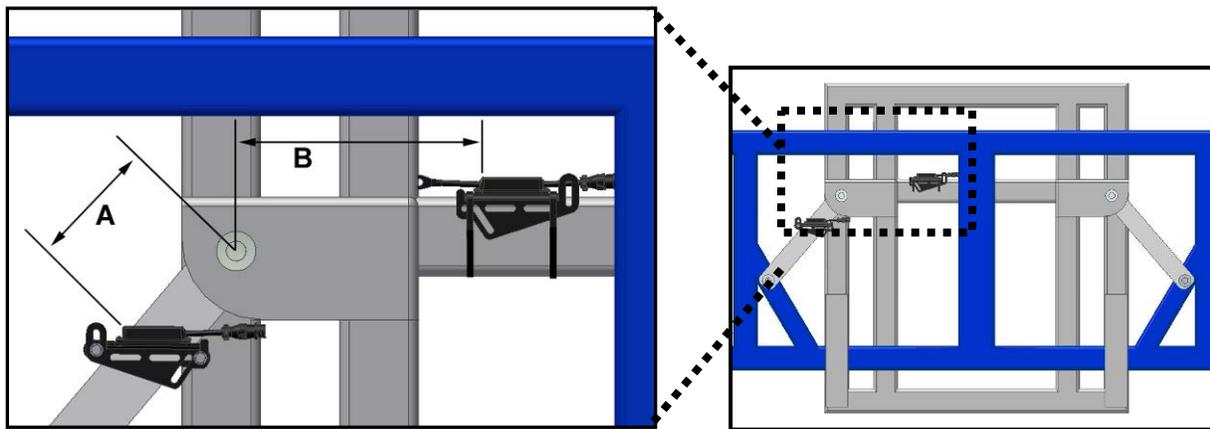


Figure 32: Roll Sensor Mounting on a Trapeze Suspended Boom

4.5.2 Center Pivot Booms

1. Mount the Roll Sensor with the temperature probe to the chassis (non-pivoting portion of the sprayer) and the other Roll Sensor to the boom frame.
2. For optimal performance, minimize the distance between the Roll Sensors (A) and minimize the height from each Roll Sensor to the pivot point (B).
3. Ensure the Roll Sensors are relatively level when the sprayer boom and chassis are level.
4. Both Roll Sensor cables should be pointing towards the right hand wing of the sprayer.

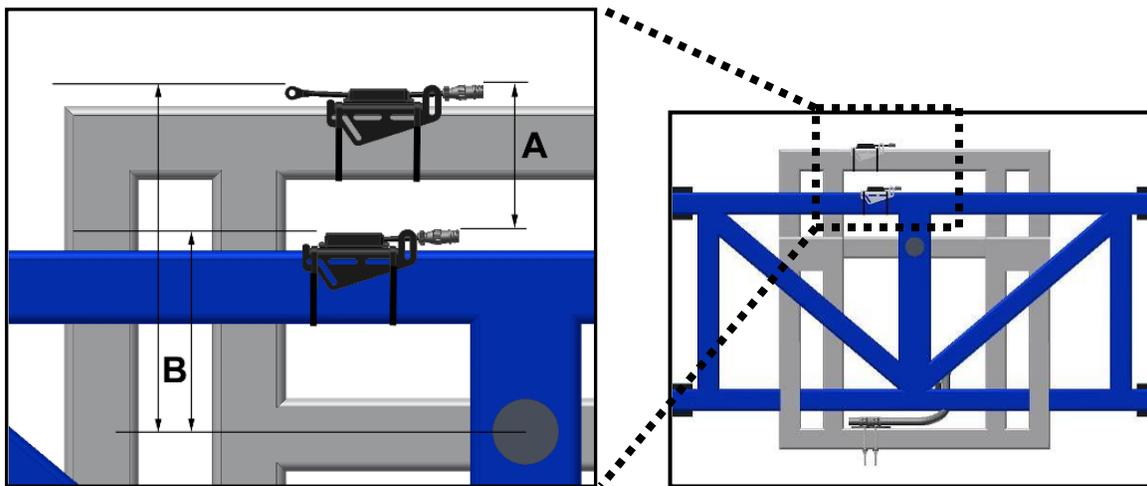


Figure 33: Roll Sensor Mounting on a Center Pivot Suspended Boom

4.5.3 High Pendulum Booms

1. When mounting the Roll Sensors, mount one to the boom frame and one to the chassis (non-pivoting portion of the sprayer).
2. For optimal performance, minimize the distance between the Roll Sensors and minimize the height from each Roll Sensor to the pivot point (A & B).
3. If the system is driving the slant function, the Roll Sensor must be mounted to the boom frame as shown below.
4. If slant control is not enabled, the boom frame Roll Sensor should be mounted on or near the top pendulum pivot point.
5. Ensure the Roll Sensors are relatively level when the sprayer boom and chassis are level.
6. Both Roll Sensor CANbus cables must be pointing towards the right hand wing of the sprayer.

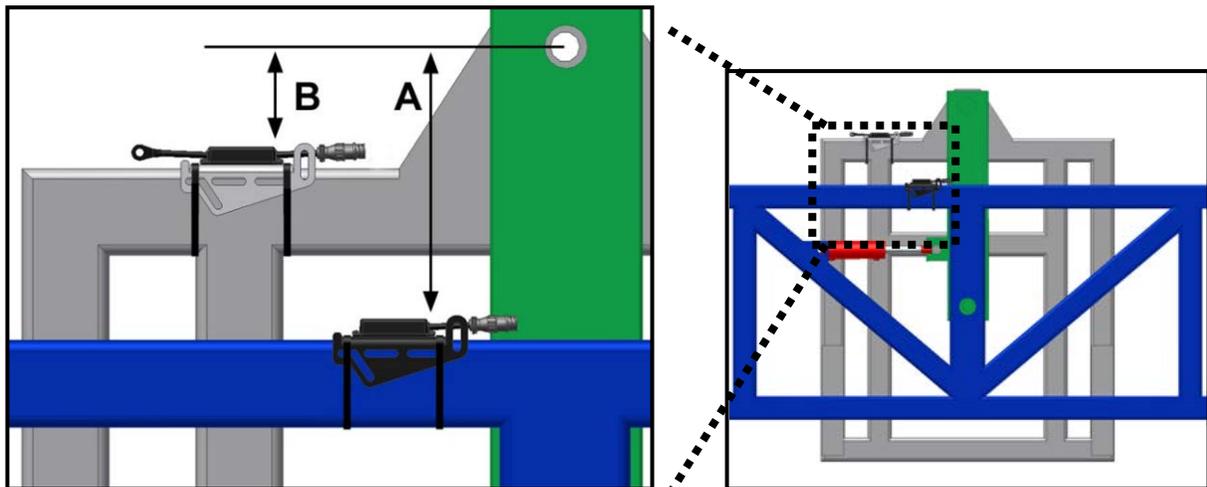


Figure 34: Roll Sensor Mounting on a High Pendulum Boom

4.6 Roll Sensor Mounting (Enhanced Stability)

1. The Roll Sensors must be installed in the following serial number order:

Serial Number	Roll Sensor Location
Lowest	Intermediate Frame (IF)
Middle	Boom Frame (BF)
Highest	Reference Frame (RF)

Figure 35: UC4+™ Enhanced Stability Roll Sensor Serial Number Order

2. Mount the boom frame (BF) and intermediate frame (IF) Roll Sensors as described in the Passive Roll Sensor Mounting (**Section 4.5**)
3. Mount the reference frame (RF) roll sensor on the chassis of the sprayer close to the rear of the sprayer. An example of this is shown in **Figure 36**. Please refer to your installation manual for mounting instructions specific to your sprayer type.
4. The roll sensor must be oriented so the cable faces the right hand wing.



Figure 36: Example of Reference Frame Roll Sensor Mounting

4.7 Roll Sensor Mounting (Active Roll™)

4.7.1 John Deere Active Roll™

NOTE: If you have Control Panel firmware version 7D or later you must install the rods on the right hand side of the sprayer.

1. Ensure the ultrasonic sensor is mounted as shown in **Figure 37** below. It must not be mounted directly behind the wheel.
2. The frame target must be located 41" (104 cm) below the bottom of the sensor as shown in **Figure 38**. The Frame target must be aligned ½" to the left side of the centerline, and must be perpendicular to the sensor.
3. The spring target must be located 16" (41 cm) below the bottom of the sensor as shown in **Figure 38**, and must be perpendicular to the sensor. The spring target rod must be trimmed so it is 1" (2.5 cm) past the edge of the sensor as shown in **Figure 39**.

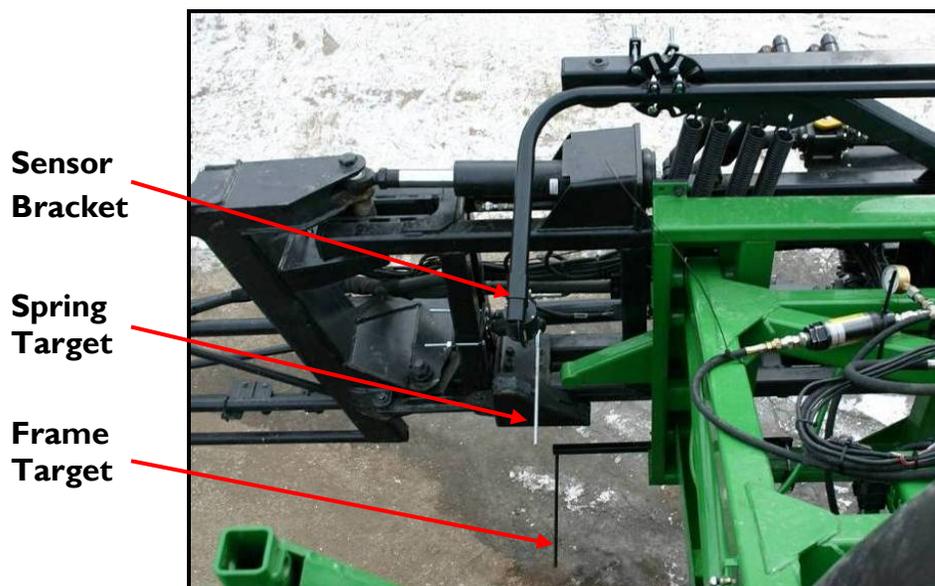


Figure 37: Typical John Deere Active Roll™ Sensor Mounting

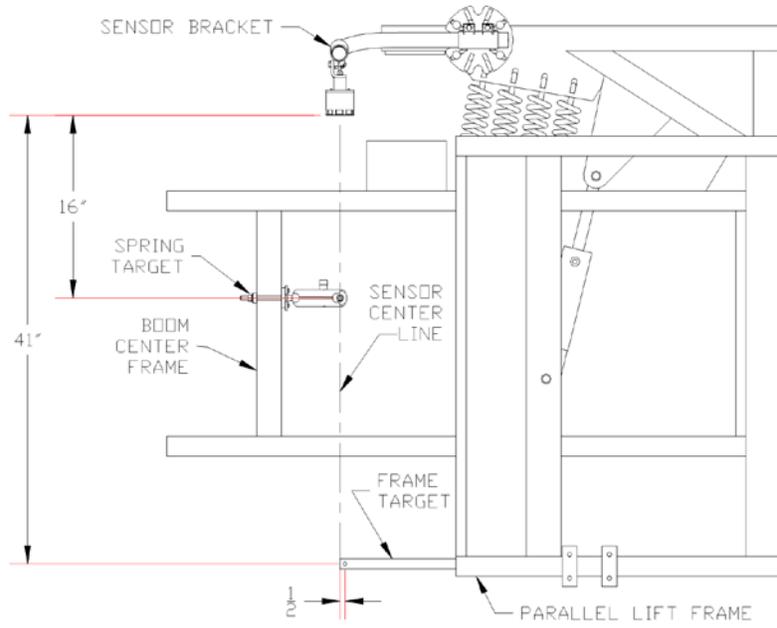


Figure 38: Active Roll™ Target Location



Figure 39: Active Roll™ Sensor and Rod Alignment

4.8 Replacing Components

The sensors are connected to the UC4+™ Control Panel using one common CANbus. The controller knows where each Height Sensor and Roll Sensor is located by its serial number, and not by where it is physically connected to the CANbus cable. Each sensor serial number is assigned to its location during the Automatic Setup or by manually assigning it in the setup menu.

If you move a Height Sensor or Roll Sensor to a new location on the sprayer, the controller will not know that you have moved the sensor. It will still report the sensor as being in the previous location until you have changed the serial number location in the setup menu.

4.8.1 Height Sensors

Moving the Sensor to a Different Location:

The following instructions are for moving a Height Sensor from one location to another. For example, moving the existing left outer sensor to the right outer location.

1. Turn off the system power.
2. Move the sensor to its new location.
3. Turn on the power. At this point the controller does not know the sensor is in a new location.
4. Assign each Height Sensor serial number to the new location (**Section 4.9.1**).
5. The previous calibration value for the new location will be used. An Automatic Setup, Retune or further calibration is not required for moving the sensor.

Replacing the Sensor with a New Sensor:

1. Turn off the system power.
2. Remove the old sensor from the sprayer and install the new sensor in the same location.
3. Turn on the power. The controller will recognize that it is missing a sensor serial number and will see that there is a new sensor serial number on the CANbus. It will automatically assign the new serial number into the old serial number's location.
4. The previous calibration values will be used for the new sensor. An Automatic Setup, Retune or further calibration is not required for replacing the sensor.

4.8.2 Roll Sensors (Passive Roll)

Replacing a Roll Sensor with a New Sensor:

1. Turn off the system power.
2. Remove the old Roll Sensor from the sprayer and install the new sensor in the same location.
3. Turn on the power. The controller will recognize that it is missing a sensor serial number and will see that there is a new sensor serial number on the CANbus. It will automatically assign the new serial number into the old serial number's location.
4. The previous calibration values will be used for the new sensor. An Automatic Setup, Retune or further calibration is not required for replacing the Roll Sensor.

4.8.3 Roll Sensors (Enhanced Stability)

Replacing a Roll Sensor with a New Sensor:

1. Turn off the system power.
2. Remove the old Roll Sensor from the sprayer.
3. The two existing Roll Sensors and the new Roll Sensor must all be installed in the correct serial number order. This may involve moving the two existing Roll Sensors to a new location.
4. The Roll Sensors must be installed in the following serial number order:

Serial Number	Roll Sensor Location
Lowest	Intermediate Frame (IF)
Middle	Boom Frame (BF)
Highest	Reference Frame (RF)

Figure 40: Enhanced Stability Roll Sensor Serial Number Order

5. Turn on the power. At this point the controller does not know the sensor is in a new location.
6. Assign each Roll Sensor serial number to the new location (**Section 4.9.1**).
7. The previous calibration values will be used for the new sensor. An Automatic Setup, Retune or further calibration is not required for replacing the sensor.

4.8.4 Roll Sensors (Active Roll™)

Moving the Ultrasonic Roll Sensor to a Different Location:

If you are moving the Active Roll™ Sensor to a new location or moving a Height Sensor to the Active Roll™ location, you will be required to perform a new Automatic Setup.

Replacing the Ultrasonic Roll Sensor with a New Sensor:

1. Turn off the system power.
2. Remove the sensor from the sprayer and install the new sensor in the same location.
3. Turn on the power. The controller will recognize that it is missing a sensor serial number and will see that there is a new sensor serial number on the CANbus. It will automatically assign the new serial number into the old serial number's location.
4. The previous calibration values will be used for the new sensor. An Automatic Setup, Retune or further calibration is not required for replacing the sensor.

Replacing the Temperature Sensor (Passive Roll Sensor) with a New Sensor:

Some Active Roll™ systems include a single passive roll sensor for the purpose of measuring the valve block temperature. The following instructions are for replacing the single passive roll sensor on Active Roll™ systems.

1. Turn off the system power.
2. Remove the old Roll Sensor from the sprayer and install the new sensor in the same location.
3. Turn on the power. The controller will recognize that it is missing a sensor serial number and will see that there is a new sensor serial number on the CANbus. It will automatically assign the new serial number into the old serial number's location.
4. The previous calibration values will be used for the new sensor. An Automatic Setup, Retune or further calibration is not required for replacing the Roll Sensor.

4.8.5 Control Panel

Note: Replacing the Control Panel will clear all the previous settings and require you to perform a new Automatic Setup.

Note: Product warranty is recorded using the Control Panel serial number. If you are replacing a Control Panel, please report the change in serial number and owner information to Norac at service@norac.ca to update the warranty.

1. Turn off the system power.
2. Remove the Control Panel from the sprayer and install the new Control Panel.
3. Turn on the power.
4. Perform an Automatic System Setup (**Section 4.2**).

4.9 Height Sensor Setup

4.9.1 Configuring the Sensors

Before beginning, write down the serial number and location for each of the sensors. The serial number is located on the bottom of the sensor housing, beside the foam disc.

Note: Older versions of sensors have the serial number located on the side of the housing so it may be necessary to remove the sensor from the bracket to view the serial number.

1. Navigate to the Sensor Setup menu (Run Screen->toggle "Sensor Display" until "More?"->toggle "Yes"-> toggle "Sensor Display" until Left, Right etc..->toggle "Yes").
2. The left channel menu prompts are shown below. For other channels, the basic structure and behavior of the prompts is the same.

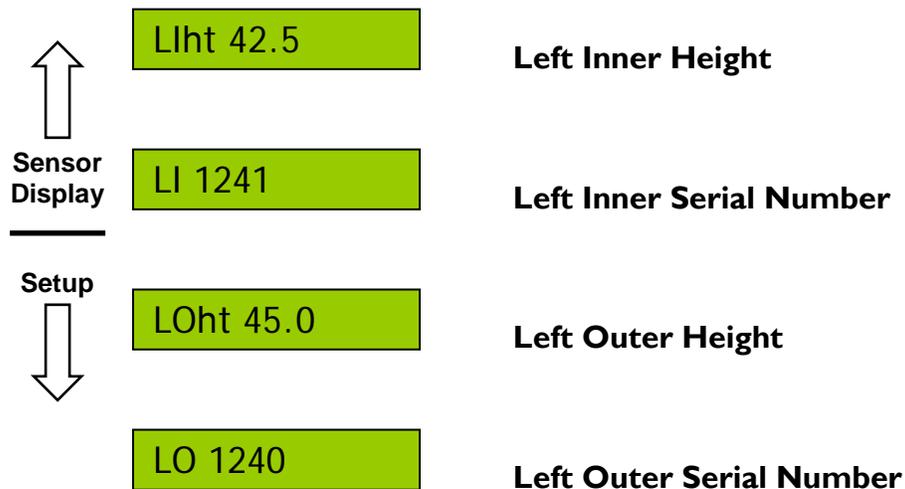


Figure 4I: Sensor Setup Menu (for Left Channel)

3. Navigate to the sensor location you would like to change, for example, "LO" for the left outer sensor. This screen will show the previously installed sensor serial number (if any) as shown in **Figure 4I**.
4. Toggle the "+/-" switch once to search for all the connected sensors.
5. Use the "+/-" switch to toggle through a list of available sensor serial numbers with their respective "live" height readings.
6. When the desired serial number is shown, toggle "Auto (Yes)" switch to confirm.
7. To return to the Run Screen, press and hold the "Setup (No)" or "Sensor Display" switch for two seconds.

4.9.2 Calibrating the Sensor Height

1. Navigate to the Sensor Setup menu (Run Screen->toggle "Sensor Display" until "More?"->toggle "Yes"-> toggle "Sensor Display" until Left, Right etc..->toggle "Yes") (**Figure 41**).
2. Select the sensor location (Example: LOht = Left Outer Height).
3. Measure from the ground to the bottom of the nearest sprayer nozzle tip (closest to the sensor location you selected).
4. If the currently displayed "live" height reading is not correct, adjust it using the "+/-" switch. The "+" switch will increase the reading; the "-" switch will decrease the reading.
5. To return to the Run Screen, press and hold the "Setup (No)" or "Sensor Display" switch for two seconds.

Note: To view the absolute height reading from the sensor to the ground, press and hold the "AUTO (YES) switch from the "LOht" menu. This height reading can be useful for troubleshooting purposes.

4.10 Roll Sensor Setup (Passive Roll)

4.10.1 Configuring the Sensors

1. Navigate to the Sensor Setup menu (Run Screen->toggle "Sensor Display" until "More?"->toggle "Yes"-> toggle "Sensor Display" until "Roll"->toggle "Yes").

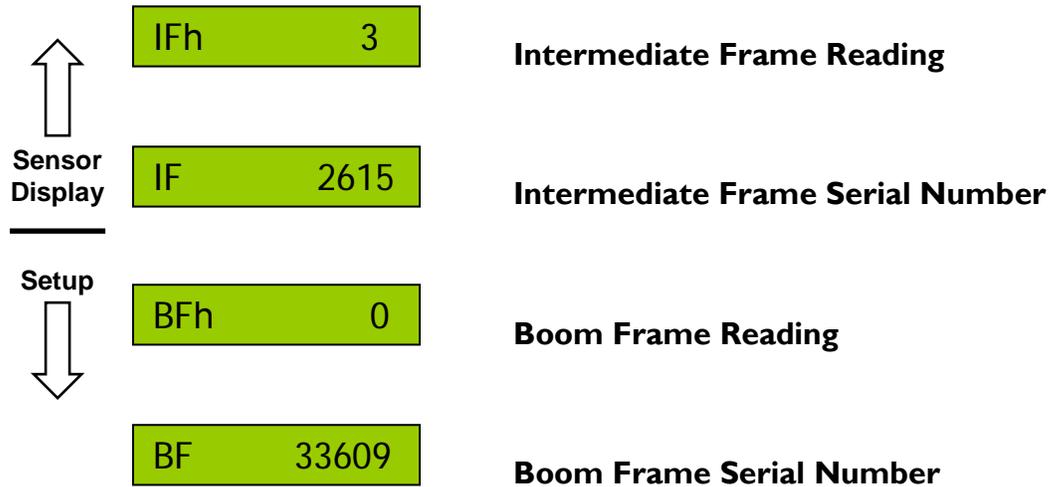


Figure 42: Roll Sensor Setup Menu

2. Navigate to the Boom Frame Roll Sensor (BF). The screen will show the previously installed sensor serial number (if any) as shown in **Figure 42**.
3. Toggle the "+/-" switch once to search for all the connected sensors.
4. Use the "+/-" switch to toggle through a list of available sensor serial numbers.
5. When the desired serial number is shown, toggle "Auto (Yes)" switch to confirm.
6. Repeat for the Intermediate Frame (IF) Roll Sensor.
7. To return to the Run Screen, press and hold the "Setup (No)" or "Sensor Display" switch for two seconds.

4.10.2 Calibrating the Sensors

The Passive Roll Sensors are calibrated during the Automatic Setup and do not need further calibration unless your system also has slant control.

If your system has the slant function enabled (on/off valve for roll) then the BFh and IFh roll sensor values must be zero when the sprayer chassis and boom are level. The following instructions explain how to zero the readings.

1. Ensure the sprayer chassis and boom is level.
2. Navigate to the Roll Sensor Setup menu (Run Screen->toggle "Sensor Display" until "More?"->toggle "Yes"-> toggle "Sensor Display" until "Roll"->toggle "Yes"->toggle "Sensor Display" until "BFh").
3. Set the roll sensor reading to zero using the "+/- " switch. The "+" switch will increase the reading, the "-" switch will decrease the reading.
4. Repeat for the Intermediate Frame Roll Sensor (IF).
5. To return to the Run Screen, press and hold the "Setup (No)" or "Sensor Display" switch for two seconds.

4.11 Roll Sensor Setup (Enhanced Stability)

The Roll Sensors are automatically configured and calibrated during the Automatic Setup for Enhanced Stability and should not be configured manually.

To confirm the sensors are configured correctly follow the instructions below:

1. Navigate to the Roll Sensor Setup menu (Run Screen->toggle “Sensor Display” until “More?”->toggle “Yes”-> toggle “Sensor Display” until “Roll”->toggle “Yes”->toggle “Sensor Display” until “BF”).
2. Ensure the BF serial number matches the serial number of the Roll Sensor on the boom frame.
3. Repeat for the IF and RF sensors.
4. The Roll Sensors must be installed in the following serial number order:

Serial Number	Roll Sensor Location
Lowest	Intermediate Frame (IF)
Middle	Boom Frame (BF)
Highest	Reference Frame (RF)

Figure 43: Enhanced Stability Roll Sensor Serial Number Order

4.12 Roll Sensor Setup (Active Roll™)

4.12.1 Configuring the Sensor

The Active Roll™ Sensor is automatically configured during the Automatic Setup and should not be configured manually.

4.12.2 Calibrating the Sensor

1. Ensure the sprayer chassis and boom is level.
2. Navigate to the Roll Sensor Setup menu (Run Screen->toggle "Sensor Display" until "More?"->toggle "Yes"-> toggle "Sensor Display" until "Roll"->toggle "Yes"->toggle "Sensor Display" until "BFh").
3. Set the roll sensor reading to zero using the " +/- " switch. The " + " switch will increase the reading, the " – " switch will decrease the reading.
4. Repeat for the Intermediate Frame Roll Sensor (IF).
5. To return to the Run Screen, press and hold the "Setup (No)" or "Sensor Display" switch for two seconds.

4.13 Output Channel (Valve) Setup

4.13.1 Calibrating the Deadzone

1. Ensure you are in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the calibration over standing crop, weeds/grass, wet concrete, water or snow.
2. Ensure the sprayer is at operating temperature and RPM. Turn on the solution pump if possible.
3. Navigate to the hydraulic setup menu (Run Screen->toggle “Setup” until “More?”->toggle “Yes”-> toggle “Setup” until Left, Right etc..->toggle “Yes”).
4. Select the DZ screen for the boom function you wish to calibrate.
5. Press and hold the “Manual” switch.
6. Continue to hold it until the boom stops moving and the live reading of the distance travelled stabilizes.
7. When properly tuned, the distance travelled should be 1-2 inches (2-5cm). Adjust the deadzone value until the distance travelled is within the range.
8. Alternatively, you can press and hold the “Auto (Yes)” switch to automatically calibrate the deadzone.
9. Typical deadzone values are shown in **Section 3.12.1**.

Note : The roll (on/off valve) deadzone is typically defaulted and should not be manually calibrated.

Note: If you get very inconsistent deadzone values each time you perform this test it may be an indication that there is air in the hydraulic lines or the wing accumulators do not have orifices installed.

Note: If you cannot calibrate the deadzone value within the specified range or if the wing deadzones are calibrating close to 128 you may have a problem with the bypass cable. It is possible for some systems to be able to calibrate the deadzone value even if a required bypass cable is not installed. This occurs by the valve signal feeding back through the sprayers wiring and firing the bypass valve. Check the bypass cable installation and ensure it is correctly installed. This problem typically only appears on trailed Flexicoil and New Holland sprayers that require the bypass cable but do not have it installed.

4.13.2 Calibrating the Gain

1. The Gain calibration is dependent on the Deadzone value. Before calibrating the Gain, you must calibrate the Deadzone value first for the same channel.
2. Ensure you are in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the calibration over standing crop, weeds/grass, wet concrete, water or snow.
3. Ensure the sprayer is at operating temperature and RPM. Turn on the solution pump if possible.
4. Navigate to the hydraulic setup menu (Run Screen->toggle “Setup” until “More?”->toggle “Yes”-> toggle “Setup” until Left, Right etc..->toggle “Yes”).
5. Select the KP screen for the boom function you wish to calibrate.
6. Press and hold the “Auto (Yes)” switch to calibrate.
7. Typical gain values are shown in **Section 3.12.2**.

Note: The manual gain test (pressing and holding “Manual”) is not intended for calibrating the gain setting. The manual gain test will only drive the specified valve at 100% for one second and report the boom speed. The boom speed does not change if the gain value is changed.

Note: The gain values for the roll (proportional) and slant (on/off) functions are typically defaulted and should not be calibrated using the automatic gain test.

4.14 Boom Geometry Calibration

The following steps will automatically calibrate the boom geometry values.

1. Ensure you are in a location that is relatively level and where the sensors are over bare soil or gravel. Do not conduct the calibration over standing crop, weeds/grass, wet concrete, water or snow.
2. Ensure the boom is level and approximately 1 to 1.5m (3 – 5 feet) above the ground.
3. Navigate to the Boom Geometry Calibration menu (Run Screen->toggle “Setup” until “More?”->toggle “Yes”-> toggle “Setup” until “Roll”->toggle “Yes”).
4. Press and hold "Auto (Yes)" from the "Roll On" screen to launch the Boom Geometry Calibration.
5. Once you launch the Boom Geometry Calibration the display will prompt you to exit the cab and manually push either boom tip down.



6. Do not walk near the sensors when approaching the boom. Stay at least 3 feet from the sensor to not induce a measurement error.
7. Push either boom tip down 1 – 3 feet (30 – 90 cm) for a moment and then let go. Do not push the boom to the ground.
8. Typical boom geometry values are shown in **Section 3.12.3**.

4.15 Updating the Firmware

The UC4+™ Control Panel firmware can be updated by your local NORAC Dealer or by contacting NORAC.

4.16 Sprayer Types

Type	Sprayer Model	Type	Sprayer Model
AN2	Generic Sprayer Boom	HG1	Hagie STS10 and 12, Year 2000-2004
AP1	Apache (Year 2001-2009) with EHS	HG2	Hagie 264, 284XP, DTS8, 2100, 2101, DTS10
AP2	Apache 2005+ with EHS	HG3	Hagie 2005 STS
BA1	Bateman Sprayers - Variable Geometry Type (Metric)	HG4	Hagie STS STS 120 with Proportional Main Lift and Active Roll
BA2	Bateman Sprayers - Fixed Geometry Type (Metric)	JD6	John Deere 4920
BT2	Brandt SB4000	JD7	John Deere 4720, 4710, 4700
BT3	Brandt SB4000 with Suspension	JD8	John Deere 4730, 4830, 4930
CS1	Case IH 4260, 4410 (Year 2000+)	JD9	John Deere 4630, 4730, 4830, 4930 with Proportional Main Lift
CS2	Case IH 3150, 3185, 3200, 3310, Tyler Patriot	JD10	John Deere 4930
CS3	Case IH 20 and 30 Series	MC1	Miller Condor and NH Monobeam Boom with EHS
CS4	Case IH 20 and 30 Series with Proportional Main Lift	MC2	Miller Condor and NH Rear-MountTruss Boom with EHS
EV1	Evrard LPAG2, LPAG5 Autoheight (Metric)	MS1	MS Sprayers
EV5	Evrard Autoslant (Metric)	NT2	Nitro-Miller Technologies 120 Foot Boom
FC1	Flexi-Coil Pull-Type Sprayer, 67 Series (Year 1999+)	NT3	Nitro-Miller Technologies 90 Foot Boom
FC2	Flexi-Coil/NH/Caselh 68 Series, SF210/216, SRX100/160	OM1	Original Equipment Manufacturer (NORAC Wiring and Grip)
FT1	Fast with Directional Manifold	RA1	Rau Sprayers - Variable Geometry Type (Metric)
FT2	Fast with Active Roll	RA2	Rau Sprayers - Fixed Geometry Type (Metric)
FT5	Fast OEM Style Install 5 Station (Norac Grip)	RG2	Rogator Sprayer 64 and 74 Series
FT6	Fast OEM Style Install 6 Station (Norac Grip)	RG4	Rogator Sprayer 854, 1054 and 1254 Series
GM1	Gregson Maverick 120 Series (Year 1999+)	RG5	Rogator Sprayer with ActiveRoll (LRC)
GN1	Generic Pendulum Boom with Slant Control (Metric)	RG6	Rogator Sprayer with ActiveRoll (LRC) and Prop. ML
GN2	Fixed (non-VG) Boom with Slant Control (Metric)	SC1	SpraCoupe 7000 Series
GN4	Generic Pendulum Boom with Prediction (Metric)	SC4	SpraCoupe 4000 Series
HD1	Hardi Retrofit Install North America	SM1	Summers Pull-Type
HD3	Hardi Factory Install - Australia	SM2	Summers Pull-Type with Proxy Switch Sense
HD4	Hardi Denmark LPZ, HPZ, HAZ Autoheight (Metric)	SM3	Summers Pull-Type with Proxy Switch Sens and Prop. ML
HD5	Hardi Autoslant (Metric)	TA1	Top Air
HD6	Hardi Denmark HAZ 32-36m Autoheight (Metric)	WR1	Wilmar 8100/8500
HD8	Hardi Terraforce (Metric)	WR2	Wilmar 8400/8600

Figure 44: Sprayer Types

4.17 Maintenance

The NORAC Spray Height Control system requires very little maintenance, but there are a few procedures that will ensure the system continues to work correctly for many years.

Before each day:

- It is highly recommended that the sprayer friction pads are greased. **To ensure optimum performance this should be done daily.** This will ensure the boom is pivoting separately from the sprayer. It is very important to keep the friction pads greased on Active Roll™ systems.
- Ensure the height sensor breakaway brackets are functioning correctly. Apply grease to the moving parts if necessary, to ensure they return to center after a break-away occurs.
- Ensure there is a clean, dry foam disc inserted in each sensor. If it is clogged with dust or other debris, clean it as described below.

At the end of the season:

- Replace the oil filter in the NORAC hydraulic manifold annually (NORAC P/N 106285).

Cleaning Ultrasonic Height Sensors:

1. Remove the foam disc from the sensor and wash it with clean water. Squeeze out excess water and allow the foam disc to dry. The sensor can be used if the foam is wet, however you may not get a valid height reading until it has completely dried out.
2. If the transducer inside the sensor is also dirty, wash it using clean water. **Remove the sensor from the bracket and rinse debris from the transducer by pouring water across the face of the sensor. Do not submerge or pressure-wash the sensor.** A soft bristle brush can also be used to gently clean the transducer if the water alone is not sufficient. Use caution not to scratch or tear the transducer as it is fragile.
3. The sensor should be left to dry with the transducer facing downwards. The sensor can be used if it is wet, however you may not get a valid height reading until it has completely dried out. Leaving the control system powered on with the sensor connected and facing down will speed the process of drying the sensor.
4. Chemicals or compressed air should never be used to clean the sensor.

5 Warranty & Support Information

5.1 Technical Support

For technical support please contact your local dealer or contact Norac directly at:

NORAC Systems International Inc.

3702 Kinnear Place
Saskatoon, SK
S7P 0A6
Canada
T: +1 306 664 6711
T: +1 800 667 3921 (TOLL FREE)

Email: service@norac.ca

Web: www.norac.ca

NORAC, Inc.

6667 West Old Shakopee Road, Suite 111
Bloomington, MN
55438
United States
T: +1 952 224 4142
T: +1 866 306 6722 (TOLL FREE)

NORAC Europe sarl

Rue de l'hermitage
1090 Guereins
France
T: +33 426 470 442

Before contacting Norac for support please have the following information available:

- Product model: UC4+™ or UC5™?
- Product owner information: name and location.
- Sprayer make and model.
- Control Panel serial number and firmware version.
- Installation date.

5.2 Registering Your Product

To activate your warranty, the product must be registered at the time of installation or delivery. Products can be registered online at www.norac.ca. Extended parts warranty can also be purchased when registering the product warranty.

Note: Extended parts warranty must be purchased within 30 days of equipment purchase.

5.3 Statement of Limited Warranty

NORAC SYSTEMS INTERNATIONAL INC., also known as NORAC, warrants all equipment of its manufacture to be free of defects in material and workmanship for a period of one year. This warranty period is for a period of twelve months from the date the equipment is delivered by NORAC or its authorized dealer to the purchaser. Items include weighing systems, instrumentation, and control systems manufactured by NORAC. Auxiliary components not manufactured by NORAC such as tires, axles, pumps, or rebuilt parts are covered by a 6 month warranty only.

NORAC will repair free of charge items returned within the warranty period to one of NORAC's authorized Service Centers. Freight will be paid one way and returned by the same carrier unless instructed differently.

NORAC or its authorized Service Center will repair or replace, at its option, any defective part or component at no cost to the purchaser during the warranty period. If service in the field is required NORAC will authorize on-site repairs at no charge for parts and labor. Travel time, travel costs and per diem expenses to and from the place where repairs are made will be charged to the purchaser at prevailing rates.

For the nearest Service Center visit our website at www.norac.ca or call 306-664-6711.

Any evidence of negligent or abnormal use, alteration of serial numbers, not using NORAC certified or recommended parts, or repairs attempted by other than NORAC authorized personnel automatically voids the warranty. Normal wear is not covered under this warranty.

NORAC will not warranty any complaints relating to inadequate installation (unless the installation was performed by NORAC), adjustments or calibration.

The forgoing states the entire liability of NORAC regarding the purchase and use of its equipment. NORAC will not be held responsible for any consequential loss or damage of any kind.

This warranty is in lieu of all other warranties, except as set forth above. Any implied warranty merchantability or fitness for a particular purpose is hereby disclaimed. This warranty is in lieu of all other warranties, expressed or implied.

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